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IROQUOIS IRON CO. PLANT

Byproduct Gas Burned in Boilers Supplying Steam to Complete Turbine Installation

IT IS NOT EVERY industry that can develop the power required to operate it with a byproduct fuel and yet have a surplus to throw away, neither is it possible for many plants to have 13 big boilers operated by only one fireman and one water tender. During the past decade vast strides have been made in the iron industry and those of us who in our early years read so much about the smoke darkened iron industrial cities, now read about how the community is furnished with power by the utilization of this gas which formerly polluted the atmosphere.

There are many points of difference between the former iron reducing plant and that which can at the present time be called modern. A brief review of the process as employed in the plant of the Iroquois Iron Co. in So. Chicago, introductory to a description of the power plant, will aid in comprehending the power plant problem.

Iron ore is brought into the docks in the Calumet River in lake boats from which it is unloaded by grab buckets and dumped into piles in the yards of the company. Iron ore is in the form of iron oxide and old man "Weather" cannot injure it or cause it to burn by spontaneous combustion, so no protection from the elements is given the ore.

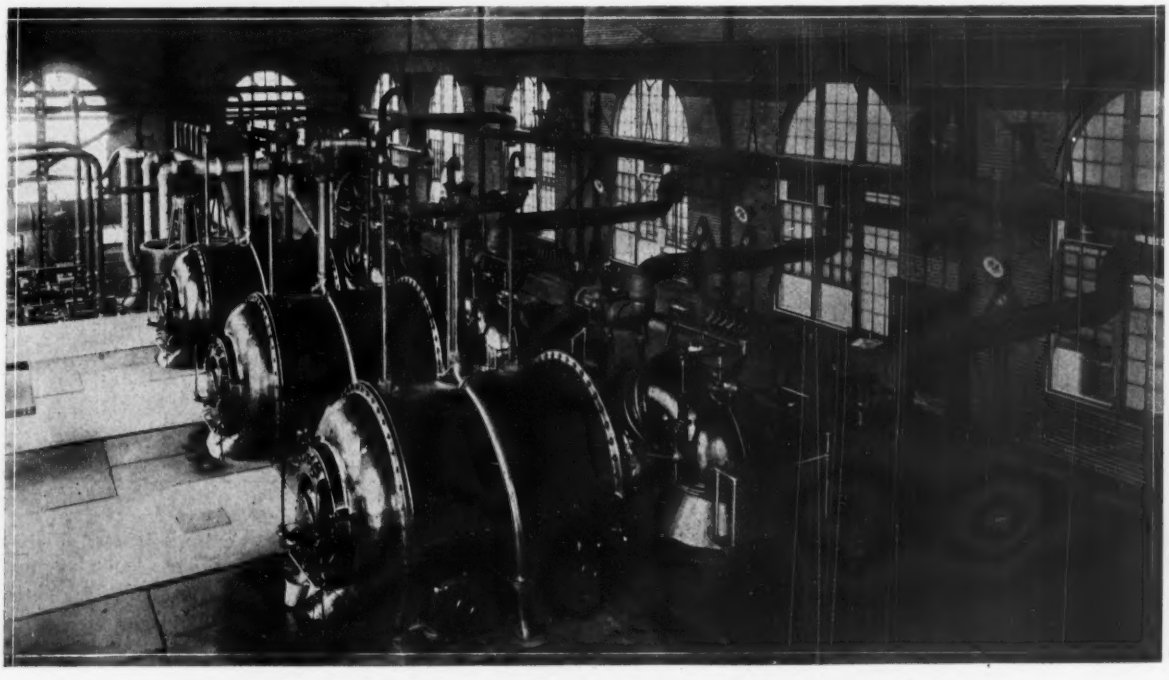


FIG. 5. TURBINE DRIVEN CENTRIFUGAL BLOWERS IN IROQUOIS IRON CO. PLANT

In the stock-house the ore is mixed in proper proportions with coke and limestone, coke furnishes the heat necessary to melt the iron ore while the limestone acts as a flux. This mixture is hauled to the top of the blast furnace on an inclined track and there dumped upon a charging bell. The operation of the bell is similar in all respects to that used in charging gas producers, so that when the furnace needs a fresh supply, the bell is lowered and the contents drop into the furnace.

To reduce the ore it is necessary to separate the oxygen from the iron. This is done by heating it in the presence of coke which unites with the oxygen. There is not, however, enough oxygen in the iron ore to burn the coke necessary to furnish sufficient heat, so a great amount of hot air is necessarily introduced through tuyeres at the bottom of the furnace.

Combustion in the blast furnace is necessarily incomplete since the object is to take all oxygen from the iron and to do this the air supply must be only sufficient to cause heat enough to melt the iron ore.

From the tops of these furnaces, the gases are conducted through dust collectors thence to the boiler furnaces or to the stoves, as they are called, for heating the air supplied to the blast furnaces, where the combustion is completed.

The iron is drawn off at the bottom of the furnace into large ladles of 40 tons capacity and hauled to the pig machine where it is poured into the molds. Pig iron is not molded in sand as it was in the early days of the iron industry, but in traveling molds which resemble, in many respects, bucket coal conveyors. The iron is poured into these molds as they pass under the ladle and is conveyed to and dumped into steel cars. During the conveying, the iron is cooling, so that when it reaches the car the iron is set and after being dumped is further cooled by a constant steam of water as the pigs fall into the car.

Steam Generation

OUR interest is naturally in the power plant and a description of it in detail will bring out a number of interesting features which are not common to all plants.

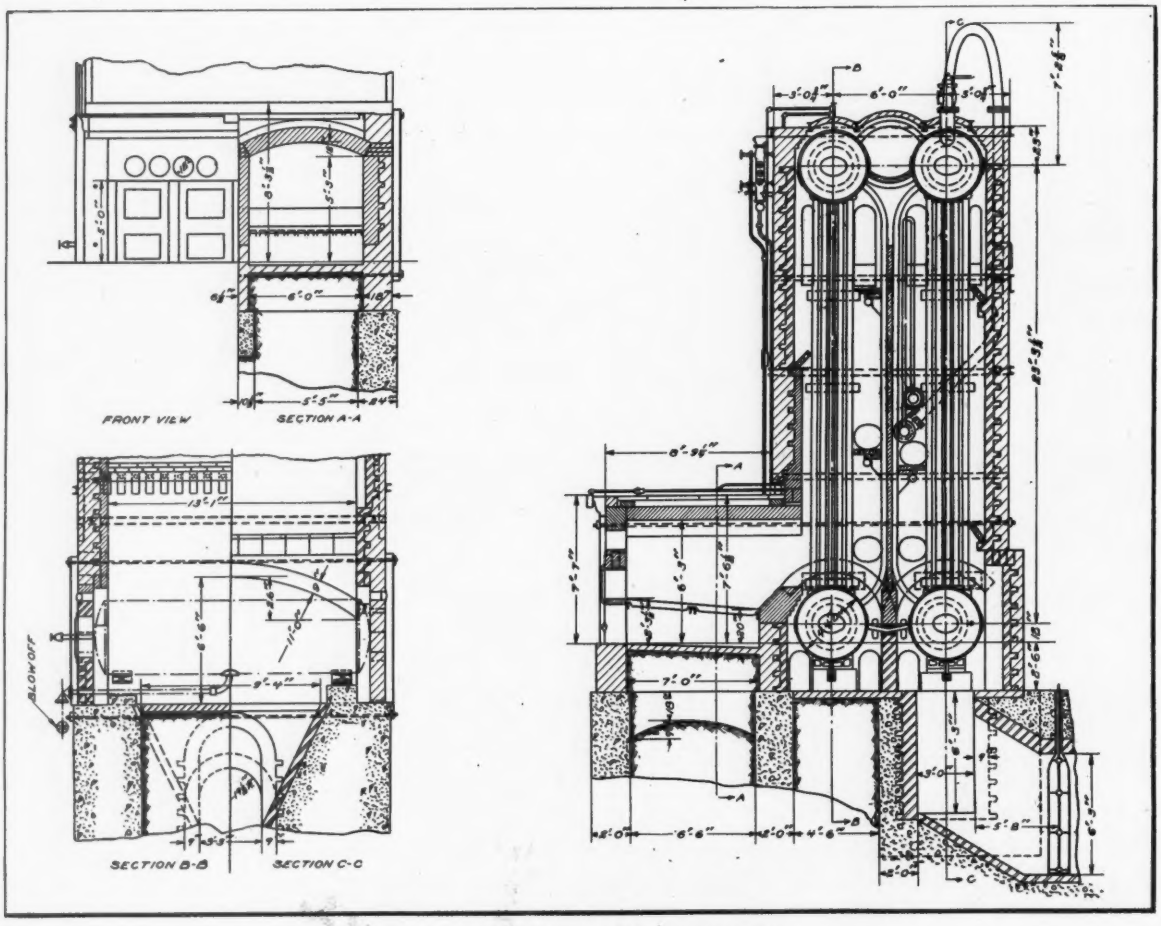


FIG. 1. CROSS-SECTIONS OF RUST BOILERS

The boiler house is a building apart from the others and contains 13 water-tube Rust boilers, each having a capacity of 500 hp. The illustration Fig. 1 shows the construction. There are 89 straight tubes, 18 tubes connecting the upper drums and 19 curved tubes between upper and lower drums, all 4 in. in diameter. The pressure carried is 165 lb. and the superheat is 400 to 425 deg. Each lower drum of the boiler is provided with a blowoff, as is also the superheater, which discharges into the condenser hot well.

There are 2 blast furnaces in this plant and from each the discharge gases are conducted to the main header in the boiler room or to the furnace stacks, if not needed by the boilers or stoves.

From the main header, the gas is conducted to the boiler furnaces, there being 4 burners to each boiler, the details of which are shown in Fig. 3. The gas pressure carried is about 15 oz. average.

Gas produced from the blast furnaces is not ideal for burning under boilers, it is a byproduct and must be used as delivered. As a rule, however, it burns readily but occasionally the constituency will change to such an extent that it will not ignite, so it is the practice to maintain a bed of coal on the grates to insure proper ignition. The furnaces, as will be seen in Fig. 1, are of the Dutch oven type. Another peculiar arrangement is the absence of a chimney, that is, no chimneys are built especially for the boilers, the flue gases are conducted through a tunnel to the 2 furnace stacks, an arrangement which works admirably, giving plenty of draft to complete the combustion of the gas. The boilers are looked after by one fireman and one water tender on each shift, while 2 men are employed for cleaning the boilers.

What coal is used is delivered in cars to a track in front of the boiler house and shoveled through windows to the boiler room floor. There is little or no ash made in the plant, as so little coal is burned and this undergoes complete combustion.

Turbo Blowing Equipment

THE power house is separated from the boiler house by a single railway track on which coal is delivered. The main steam header is in the power house connected by 6 well insulated pipes with the boilers, the arrangement being clearly shown in Fig. 4.

So far as was considered practical, all apparatus in the power house is turbine driven. This choice of machinery makes the use of superheated steam practical and the degree, 400 to 425, has been employed most satisfactorily.

The principal units in the plant are the blowers. Use of centrifugal positive blowers for iron works is not usual in America, but in this plant has proved most satisfactory, giving a draft of air that is steady and easily controlled. The air pressure is developed in 3 stages and averages 16 lb. and each of the 3 machines is rated to deliver 42,000 cu. ft. per min., running at 2600 r.p.m. The driving members are Curtis turbines, direct connected, each rated at 2900 hp. with steam at 150 lb., running condensing.

Bearings are all water cooled and are supplied with oil under a pressure of 25 lb. by a duplex oil pump for each unit. The relay governors are operated by oil pressure of 90 lb.

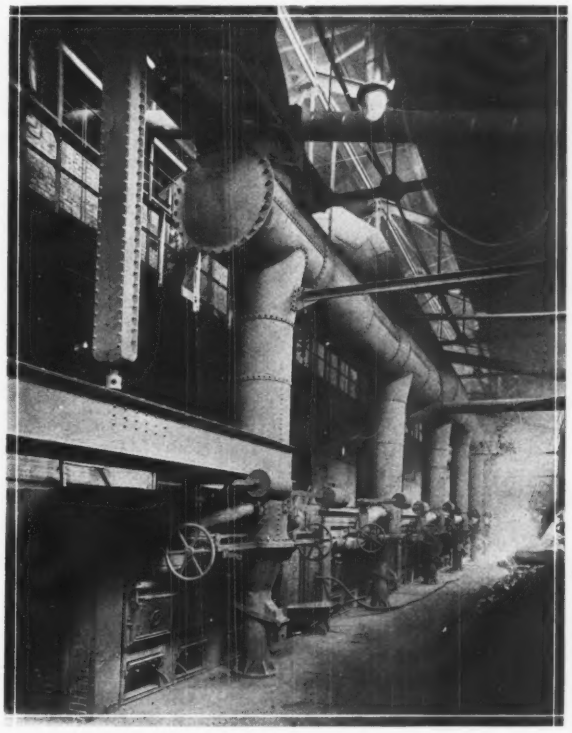


FIG. 2. VIEW IN THE BOILER ROOM

To each blower a separate air intake is provided, bringing the air by a direct concrete duct from outside the building, the inlet to one of these is shown in Fig. 6 and the details are shown in Fig. 7. Each stage has a separate water jacket, the discharge end of which is carried several feet above the blower, which gives the water sufficient head to carry it by gravity to a supply tank for the feed water heater.

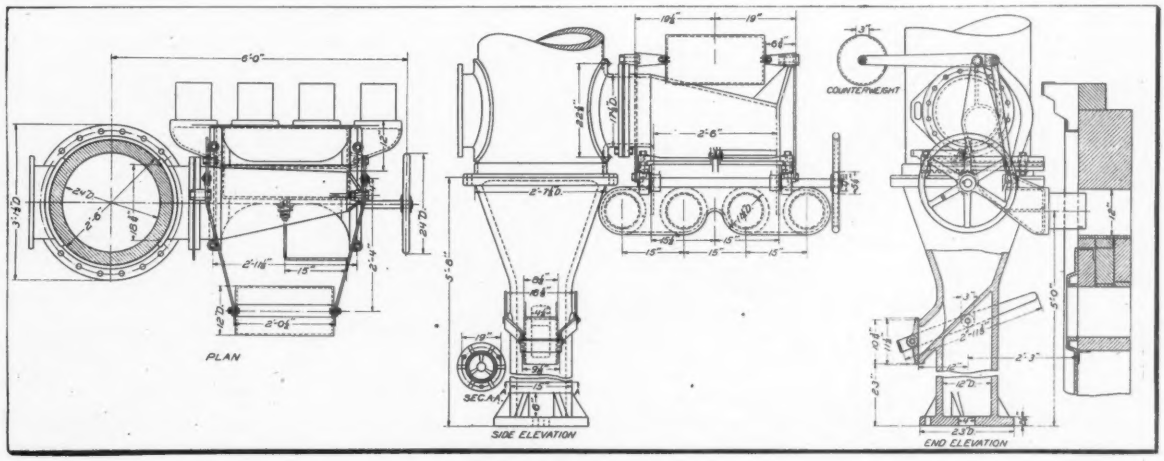


FIG. 3. DETAILS OF GAS BURNERS

The plant has 2 blast furnaces and for each of these a blower is provided, the third blower is located between the regular machines and is used as a standby, being so connected that it will deliver to either furnace.

FIG. 6. EXTERIOR VIEW OF POWER PLANT SHOWING AIR INTAKES, ALSO CONDENSER

Electric and Hydraulic Machinery

ELECTRICITY is furnished at 250 volts direct current by 3 generating units which consist of 600-kw. Crocker-Wheeler generators connected through herring bone gears to De Laval steam turbines. Speed of the turbines is 3600 r.p.m. and of the generators 600, each turbine is equipped with an Industrial Instrument Co. tachometer.

Directly in front of the generators is placed the switchboard consisting of 11 panels, 3 of which are for the control of current from the generators while the rest are service panels. An extra panel placed behind the main switchboard is used when the discharge hole at the bottom of the furnace becomes clogged up with cold metal, to burn out the iron and clay thus starting the flow of metal. This requires a heavy current so that 2 generators are used for the purpose and these have 2-way switches on their controlling panels.

The switchboard has a full complement of instruments consisting of a voltmeter, ammeters, recording instrument, switches, circuit breakers, etc., all furnished by the General Electric Co.

Two hydraulic pumps, made by the Epping-Carpenter Co., are used to furnish pressure for breaking ingots of pig iron which have become fastened together in the process of molding. These are compound condensing pumps, 19 by 34 by 4½ by 24 in., and deliver water at from 1800 to 2200 lb. pressure per sq. in.

Condensing and Pumping Apparatus

ALL the above mentioned units are run condensing, the exhaust steam being conducted through a common header to a barometric condenser just outside the west end of the plant. Water for condensing purposes

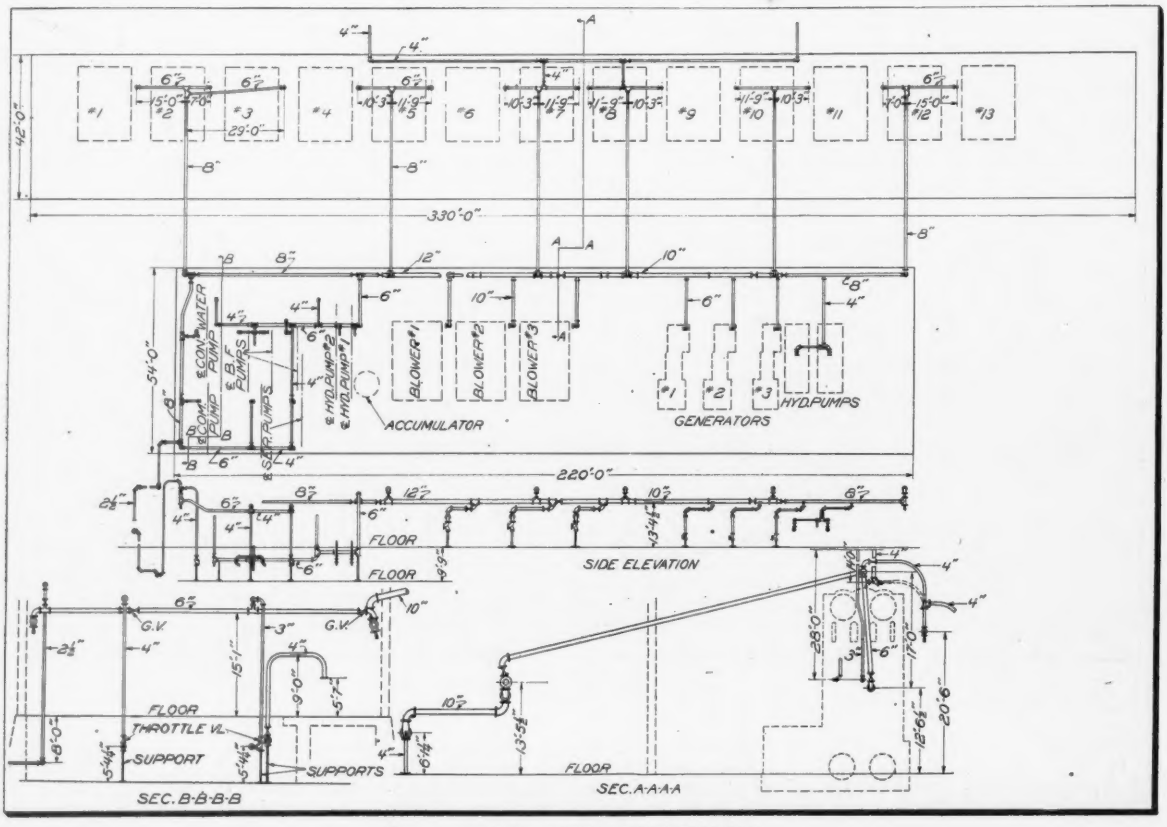


FIG. 4. STEAM PIPING ARRANGEMENT

is drawn through the intake from the Calumet River by a centrifugal pump which discharges into the head of the condenser. Water in the hot well discharges through the sewer to the lake.

The condenser vacuum pump is located inside the power house and is a reciprocating pump, 24 by 36 by 36 in., maintaining a vacuum of 27½ to 28 in. The condenser and vacuum pump were furnished by the Mesta Machine Co.

One of the most interesting features of this plant is that of pumping by turbine driven centrifugal pumps for all purposes. The complete layout is shown in Fig. 9; it consists of general service, condenser and boiler feed pumps. The 2 general service pumps are 2-stage, double shaft, driven through 10 to 1 herring bone reducing gears by a turbine which has a speed of 9000 r.p.m. Ordinary pressure on these pumps is 40 to 45 lb. per sq. in. and the capacity of each is 7000 gal. per min. The water is delivered to the 100-ft. standpipe shown in Fig. 6.

The condenser pump is of the same type but is run single stage, thus having 2 propellers connected in parallel. The speed is the same as that of the general service pumps, but owing to the parallel arrangement the capacity is increased, being 16,000 gal. per min. against a pressure of 20 lb. per sq. in.

There is also a combination pump provided to be used in case of accident to any one of the other 3 pumps. It has the same capacity as the general service pumps but the water connections to the propellers are so arranged that the propellers can be run in series when it is desired to pump to the standpipe or in parallel when pumping to the condenser.

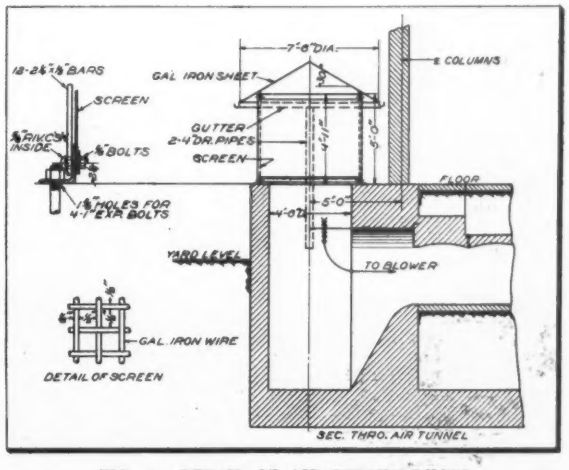


FIG. 7. DETAIL OF AIR INTAKE DUCTS

Three boiler feed pumps are provided, all located beneath the heater as shown in Fig. 9. These also are centrifugal turbine driven units but the propellers are connected directly to the turbine shaft and run at 2850 r.p.m. They are 2-stage pumps rated to deliver

FIG. 8. TURBO GENERATORS AND HYDRAULIC PUMPS

635 gal. per min. against a head of 465 ft., or 200 lb. pressure. Ordinarily 1 of these pumps is used, others being for use in cases of trouble.

All these pumps exhaust the steam into an open type Cochrane feed water heater of sufficient capacity to raise the feed water to 200 deg. after it has served as cooling water for the blowers.

A number of the gas valves, one of which is shown in Fig. 2, are operated by oil pressure as are also the charging bells for the blast furnaces. To furnish this pressure, 2 Pratt Iron Works Co. hydraulic pumps are provided; they are 10 by 2½ by 12 in., and develop 600 lb. pressure. The pumps are automatically controlled by a system of levers and chains from the accumulator, also in the pump pit.

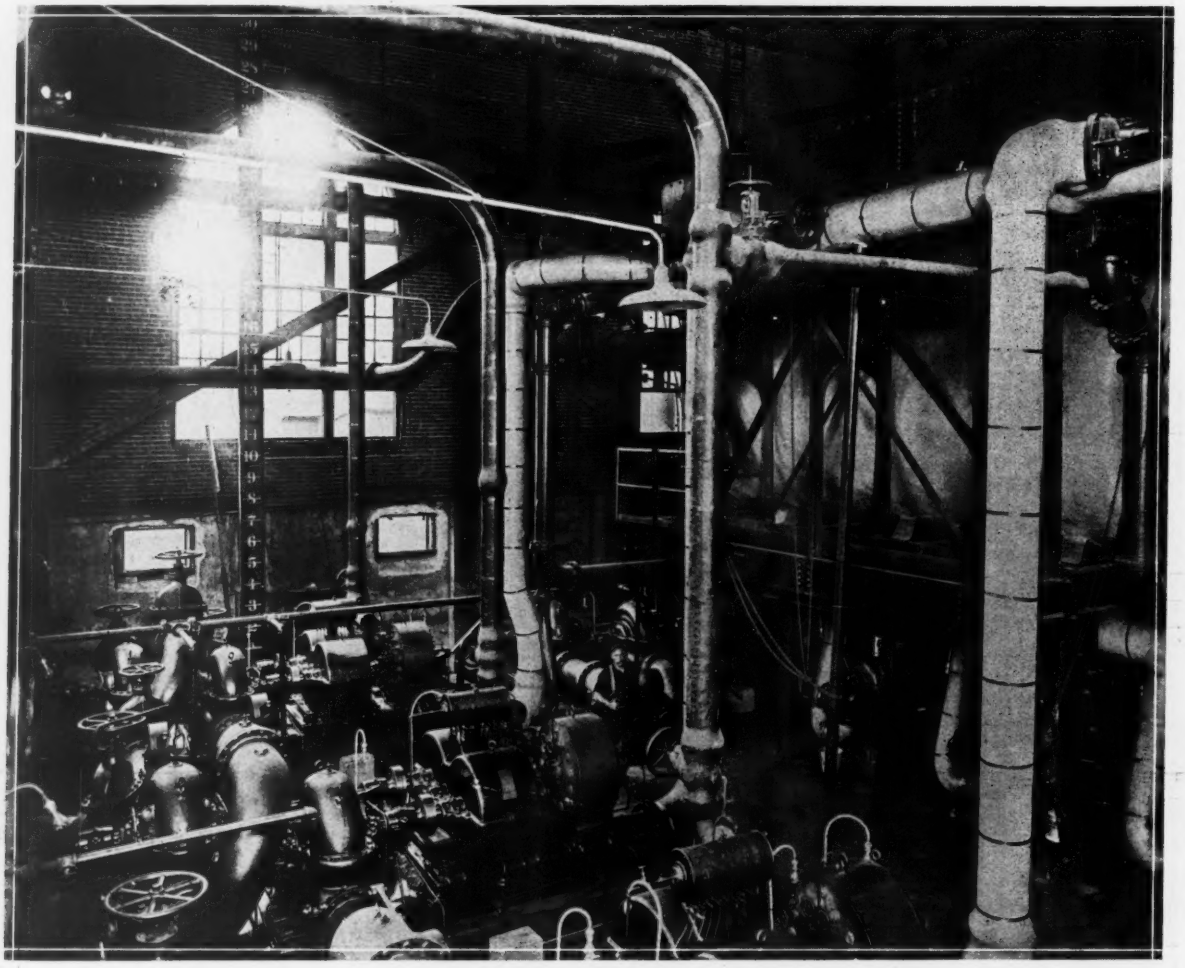


FIG. 9. VIEW OF THE PUMP PIT

To facilitate handling the power plant machinery, a 10-ton Whiting traveling crane has access to the entire power house floor and a complete machine shop at the east end of the building insures a minimum delay in making repairs.

The plant is a model in many respects and during a year and a half of operation, has proved perfectly reliable, as not a single shutdown has occurred. All electric power, water, steam and compressed air used about the works are furnished by the power plant and still there is a surplus of gas which could be used as fuel.

QUALITY OF ILLINOIS WATERS

THE quality of the water that may be found at any point along the larger streams within or bordering the State of Illinois is shown in a report which may be obtained, on application, from the United States Geological Survey. The investigation that led to this report was carried on under cooperation between the Federal Survey and the State Water Survey of Illinois, and the report was first published several years ago as Water-Supply Paper No. 239, but the large demand for it has necessitated its reissue.

The State of Illinois is well provided with water supplies, but nearly all of them are surface waters, and most of them are so greatly polluted as to be unfit for domestic use without purification. They also contain so much dissolved mineral matter and so much suspended material as to be unsuitable for many manufacturing purposes, yet by proper treatment they may be rendered safe for drinking and suitable for all industrial uses.

In planning a waterworks system for home, factory, or municipality, it is not enough to know whether the water is safe for drinking. To determine the best water for all purposes it is necessary to know the amount and character of the mineral matter it contains.

The report contains a large number of analyses of the various Illinois waters.

WHAT GERMANY CAN TEACH AMERICA

By Sterling H. Bunnell

With the end of the summer, the last of the visiting American Engineers will have returned from Germany, with new ideas of the importance of the Germans as manufacturers and engineers. When a few of the members of the great Verein Deutscher Ingenieure visited the United States a year or two ago, it was with a comfortable sense of superiority that we Americans received them, showed them our works and factories, and invited them to take what they wanted and come again for more. The visitors thanked us, complimented us and returned home to send us an invitation to return the visit.

When the full plans were disclosed, it was found that they comprised a 3-weeks' trip, by special train, through 9 cities, with every noon and evening meal provided for with special ceremony, and the best shops of each city thrown wide open for study and investigation. From Hamburg, through Leipzig, Dresden, Berlin, Dusseldorf, Cologne, Frankfort and Mannheim, to Munich, the 300 Americans, found committees of engineers at each station to welcome the party; city treasures thrown open for inspection; and conveyances and guides ready to take visitors to the shops and explain everything. When the party reached Munich at last, impressions of German country, city and manufacturing development had crowded in bewildering manner with memories of concerts, dinners, drives, and excursions not into factories. Now that goodbves have been said, and notes have been collected and brought out for study, what have American engineers to learn from Germany and the Germans?

First and foremost, the Germans are years ahead of us in economies. There are no rubbish heaps in back yards, no dumps in vacant lots, and no rusty scrap-piles in factory premises. Further, the shops are uniformly well-kept and neatly ordered within as well as without, and that without special movers or helpers. Work is neatly piled at machines and on floors; tools are few, and well-kept; and stock apparently kept up at a satisfactory minimum.

In the power plants, common German practice is ahead of our average best. Superheat has been used for years; slide-valve engines seem to be unknown today; and the poppet-valve, superheated-steam engine has actually outlived its usefulness, and is giving way to the steam turbine, while we in America have been using twice the steam and coal per horsepower. This development has been no secret; all engineers know that superheat prevents condensation in pipes and cylinders, and increases economy by large ratios. Yet we have worried over possible packing troubles, and demanded engines of old established types that could not possibly give more than ⅔ the power from the amount of coal burned, that is easily obtained by the ordinary European-built engines. There is no sign of worry by the Germans in charge of superheated-steam plants, and they show their figures of coal consumption and watts out-put with not a trace of surprise at performances about twice as good as ours.

Superheat will come in America yet, and that very soon. Coal prices will not fall, but rather they will rise; and margins of profits in factory operation will not be so easy that owners can afford to ask their engineers to burn 2 tons of coal, when one will do. In manufacturing operations where steam is used for heating, and now piped direct from the boiler in saturated condition, half the steam has usually turned to water on the way to the work. Superheat would put all the steam on to the job uncondensed, and do the same work with half the coal accordingly. Even with common slide valve or Corliss engines a little superheat will offset cylinder condensation and so save a third of the coal, without overheating the metal of the engine. Here, the Germans have much to teach us.

The superheated steam engine is, however, only the advanced practice of yesterday. It is now being superseded by better machinery. Steam turbines are in Germany much like those in America, in fact often of identical design and made by European branches of American corporations.

The turbine, though, is but part of the power plant; the steam boiler furnace comes first in the power cycle. The American visitors did not see one single shelf or inclined stoker with its large surface necessarily exposed to the air to keep from destroying the grate castings by the heat. The books have taught us for years that the economical way to fire is to scatter the coal in tiny charges and often; but we took that for book theory and not good practice. The German mechanical stokers are of the sprinkler type, very small and compact mechanisms for feeding a pound or two of coal every few seconds. The coal, which is crushed fine, is fed into a hopper in front of the boiler, dropped in small quantities against a steel wing, and shot into the furnace by the movement of the wing under the action of a revolving cam, which alternately draws it back against the tension of a spring, and then releases it. Inspection of the fire through the door shows a perfectly even surface, and coal smoothly scattered at each fling.

Economies in steam power plants are not, in Germany, confined to large central stations, but have been introduced into the isolated-plant field to an extent that shows our American practice to be grossly and unnecessarily wasteful. We have large central station plants producing a horsepower with little more than a pound of coal; but the Germans have isolated plant equipments which can be shipped complete on a railway car, and will produce a horsepower on less than a pound of ordinary German coal, and this in sizes as small as 100 hp. The producer-gas engine has nothing to offer in comparison with the German steam "locomobile," which is not a motor-car, but a portable steam plant.

Economy in the locomobile starts with the steam boiler, which is internally fired, and has plenty of small fire-tubes. The whole interior portion of the boiler, that is, the furnace, tube sheets and tubes, can be unbolted and withdrawn for thorough cleaning, so that no scale need remain to reduce economy. The steam passes from the steam dome to a superheater placed in the smoke uptake, and gains 150 deg. of superheat, so that all of the steam gets into the engine cylinder uncondensed, and no water need be trapped back for re-evaporation. Here, the saving is probably 30 per cent of the usual American coal consumption. The saving becomes 5 per cent more because of the extreme shortness of the steam pipe to the engine, which is placed right on top of the boiler, with one of its compound cylinders in the steam dome and the other in the smoke uptake; some saving may also be credited to the consequent protection from loss by

radiation of heat. The steam after expanding through the high-pressure cylinder is reheated, again in the smoke uptake, and goes to the low-pressure cylinder still superheated. The condenser is attached to the base of the boiler, and its air pump and a feed pump are driven by a crank from the engine shaft, instead of by the usual direct-acting cylinder, saving all of 10 per cent of the steam used by the boiler.

Comparing the whole apparatus with our usual noncondensing high-speed engine using 32 lb. of steam per horsepower, and supplied by a boiler taking 5 lb. of coal to provide that quantity of steam, the German locomobile shows astounding superiority. It produces 20 per cent more steam for the same amount of coal; delivers 5 per cent more to the engine throttle (because of the saving in pipe losses) and with superheat at that; does 150 per cent more work in the engine, and adds 10 per cent more useful steam by avoiding the use of separate air and feed pumps of direct-acting type. The total increase in power is therefore $1.20 \times 1.05 \times 2.50 \times 1.10$, which amounts to 3.46, or nearly 3½ times the power from the same amount of coal. But this is not all, for the radiation loss from a boiler of usual American type is at least 5 per cent, while the locomobile requires for the same horsepower produced, a boiler only $1 \div 3½$ or 2/7 the capacity of the American boiler, and accordingly saves 5/7 of the radiation loss of the latter; which is 5/7 of 5 per cent of 3½ times the locomobile's coal consumption, equal to 12½ per cent, which added to the power output of the locomobile increases its advantage over the American isolated plant from 3.46 to 3.9, or 1.28 lb. of coal for the locomobile as against 5 lb. for the American small isolated plant. The fact is even better than the figures, for the isolated plant is usually not so good as 5 lb. coal to the horsepower.

German locomobiles are found everywhere in use. The makers use their own products for generating power for their factories, saving over ¾ the coal bill of American works using the same amount of power. In Mannheim, there is a small ice-plant driven by a locomobile belted to the compressor, and fired by sawdust brought by boat from a sawmill close by. As compared with the usual American ice-plant burning a pound of coal to produce 6 or 7 lb. of ice, the German plant can show an operating cost about 1/5 as great.

In that and some other German cities it is the custom for the breweries to furnish ice free with the household supplies of beer, so that paying customers for an ice-plant are few, and the price of ice extremely low; yet the owners of the plant can make a profit because of its economy. Incidentally, the Germans do not care to pay fancy prices for pretty, transparent ice. White ice is just as cold, and cheaper to make; so white ice is the staple article. Still, transparent ice could be made by an equally economical plant, at small extra cost, by the use of multiple-effect evaporators, and at a saving to the consumer as compared with standard American manufactured ice.

It is interesting to see that attention to economies in power plants and factories has not caused the Germans to neglect the pleasant things of life. Every house has its window-boxes full of flowers; every vacant lot is utilized as a garden by some family, and every bit of field, farm, and forest is evidently watched and made to produce the best that in it lies. Attention to one detail does not mean neglect of others. The Germans have their minds set on becoming the absolute leaders of the industrial world; and they have already gone a long way toward their desired position. It is to be hoped that the recent visit of the American engineers will have for its result the setting up of new standards of good practice in economies in America.

SAFETY VALVE POINTERS

Blowing Off Pressure, How Blow-Back Is Regulated. Area of Valve Required

By Receiver

TO RELIEVE THE boiler from any internal pressure above that desired is the object of the safety valve. Figure 1 shows the older type of ball and lever valve, which, unfortunately, was often poorly constructed, the friction in the several parts excessive, and increased by careless installation, so that the lever came into contact with one of the projections forming the fulcrum, or when the boiler settled to one side, the valve disk and the stem where uniting to the lever also rubbed. The material of which the valve seat and disk were made was easily corroded and the valve often stuck to the seat. By using care in the construction and connecting up the valve, and making the valve seat and disk of bronze, a better valve was obtained.

When this type of valve relieved the boiler, its opening was sluggish and the pressure would often drop 10 lb. or more before the valve would seat; in fact, in some cases they had to be seated by hand.

The distance along the lever of the weight from the fulcrum determines at what pressure the valve will open. The farther out on the lever the weight is, the higher the pressure carried; also an increase in weight increases the blowing off pressure.

It is thus an easy matter for anyone to raise the blowing off pressure on a boiler provided with this style of valve, by adding weight on the lever, or moving the weight along the lever.

Lever Valve Calculations

LET A = area of valve in square inches; D = distance from center of valve to fulcrum; l = distance from fulcrum to center of gravity of the lever; L = distance of weight from fulcrum all in inches; P = steam pressure in pounds per square inch; W = weight of ball on lever; V = weight of valve and stem; w = weight of lever, all in pounds.

To find the weight W required for a given pressure P:

$$W = \frac{A\,P\,D - (w\,l + V\,D)}{L}$$

To find the distance from the fulcrum to locate the weight W for pressure P:

$$L = \frac{A\,P\,D - (w\,l + V\,D)}{W}$$

To find the pressure P at which the valve will blow with weight W at distance L:

$$P = \frac{W L + w l + V D}{A D}$$

The several objections mentioned, together with the ease with which the valve may be overloaded, has resulted in the abandonment of this type of valve for the modern direct or spring loaded, pop valve, Fig. 2. Here the valve disk is held to its seat by a spring, which in turn, has its tension adjusted by a bolt.

Action of Pop Valves

WORKING parts of these valves are encased so that little dust can collect, hence they are more certain in their action.

When the pressure in the boiler reaches the blowing point for which the valve is adjusted, it acts on the area of the bottom, raising the valve slightly from the seat, causing the well known singing sound. The steam thus escaping impinges on the additional area of the valve, exposed by its lifting a slight distance from its seat and the valve opens with a popping sound from which it derives its name.

These valves are provided with an attachment, usually consisting of a ring with holes drilled through it, that may be raised or lowered and thus increase or decrease the area of similar holes in the valve casing and thereby

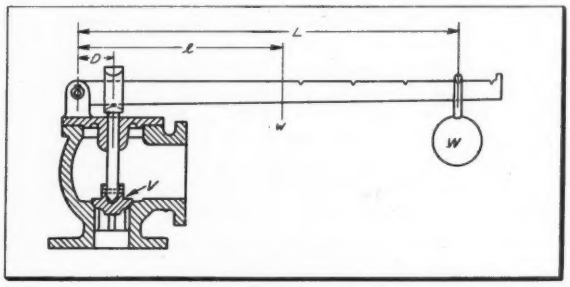


FIG. 1. TYPICAL BALL AND LEVER SAFETY VALVE

change the amount of blow-back or drop in pressure between the opening and closing of the valve. Usually 3 lb. is sufficient. These rings are adjusted from the outside of the valve case, through the removal of a plug, or a special nut.

To increase the pressure at which the valve will blow, slacken the check nut and tighten down the adjusting bolt or nut; to decrease the pressure, slacken up to release some of the tension on the spring. It is a good idea to make a mark on the valve casing and another on the adjusting bolt head or nut, so that the amount that the bolt has been turned can be easily determined. Usually turning one side of the hexagonal bolt head past a fixed mark will change the pressure about 5 lb. either way.

Springs that come with the valves are generally so made that the pressure may be changed about 15 lb. either way, and if a greater change is desired, it is necessary to send to the makers for a new spring. These valves may be obtained with a cap that may be locked and thus prevent any unauthorized person from tampering with them.

Pop valves are provided with a lever, by means of which the discs can be raised from their seats when under pressure to test the working condition.

Safety valve area is often determined by rules laid down by the state or city where the boiler is installed, but when no such legislation is in force, the following rules may be used to obtain the area:

When natural draft is used, $A = \frac{22.5\,G}{P + 8.62}$.

When steam jets or mechanical draft is used, we have, $A = \frac{1.406\,W}{P + 8.62}$.

Where G = area of grate in square feet; P = gage pressure of steam in pounds per square inch; W = weight of coal burned per hour; A = least area of safety valve in square inches.

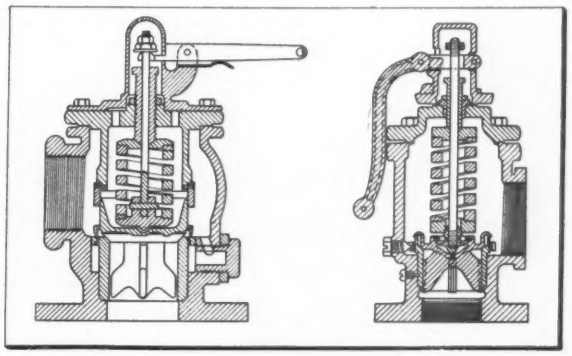


FIG. 2. TYPICAL POP SAFETY VALVES

Safety valve connections to the boiler should always be as direct as possible, with no valve of any kind intervening, and when a pipe is connected to the outlet to carry off the discharge and is fitted with an elbow in which there is a chance for condensation to collect and thus raise the blowing pressure of the valve, the elbow must be provided with an ample drip.

IN AN INVESTIGATION as to the corrosion of iron and steel by electrolysis, the Bureau of Mines has undertaken to develop a method of preventing corrosion by applying an electromotive force which will set up current in the direction opposite to that which carries the iron into solution and thus produce pitting.

This method has been used in the past to protect boilers from corrosion by hanging a bar of zinc in the boiler water and connecting it electrically to the boiler structure. In this way a current is set up from the zinc toward the iron which is opposed to the current from the iron which would be set up by the action of acids on that metal.

The Bureau of Mines found that with an acid concentration not greater than 500 parts in a million, a current density of from 0.5 to 0.8 of a milliampere per square inch, reduced the corrosion loss to a negligible quantity on a steel plate immersed in sulphuric acid solution with slow stirring. When the rate of stirring was considerably increased, a current density of 2 milliamperes per square inch was effective in reducing the corrosion loss only to 25 per cent of the unprotected plate. Taking one milliampere per square inch as the current density and 5 volts as the electromotive force, the power consumption per square foot of protected surface to prevent corrosion would be approximately ¾ watt, or 6.6 kw.-hr. per square foot of surface per year.

CONCENTRATE ALL YOUR THOUGHTS upon the work in hand. The sun's rays do not burn until brought to a focus.

—Alexander C. Bell.

Electrical Machinery and Appliances

For Generating, Transmitting and Using Current

SPARKING AND COMMUTATION

Difficulties in the Operation of D. C. Generators and Motors, and Suggestions for Overcoming Them

By William C. Thorne

COMMUTATORS in good condition should be smooth and run quietly, have a polish and a rather light chocolate color, and brushes will squeak when running slowly, such as shutting down. Oil on a commutator will collect dirt, and especially on a 500 or 750-volt machine, due to high temperature, will carbonize and short-circuit the bars, burning out the mica, or even a coil. If the mica burns out in a little spot it may be repaired by cutting out the burnt portion, cleaning well, then cutting a piece of mica which will fill the hole tightly. Cover the inside of the burnt portion and the new piece with armature varnish and wedge the new piece in. Bake well with a torch. Cut the mica off flush, and sandpaper so it will be level with the bars.

Another method is to clean well, make a stiff paste of litharge and glycerin, fill the cavity with this paste, let it stand 3 or 4 hr. and sandpaper smooth when hard. Many regard dental paste or cement as used by dentists as the best filling for a hole in mica. There are special preparations in the market which are very good. When a commutator gets pretty well worn down it is apt to spark, even if other conditions are all right, as the brush being the same width as before, it will cover more bars than it should, as the bars are narrower as they approach the shaft.

A rough pitted commutator may be due to poor quality of copper or carelessness, such as dirt or frequent overloading. It is well to lay a straight edge along the length of the bars to be sure that they are straight in length as well as even curve around the commutator. It can be smoothed by using a fine file, then 00 or 000 sandpaper and lastly a block of soft fine grained sandstone with a curvature ground in it to fit the curve of the commutator.

Figure 1 shows the commutator that is not straight from end to end and would always give trouble. Never use coarse sandpaper for finishing as it grooves the surface badly. Never use emery. It is a conductor of electricity. Due to its sharp hard nature it remains imbedded in the mica and tends to short-circuit the bars and also to convey local currents. When filing, sandpapering, polishing or turning down a commutator cover the rest of the machine if possible to keep metal dust and chips from armature and fields. Sometimes, however, through neglect or the use of poor quality brushes, or atmospheric conditions being such that insufficient lubrication of the commutator is impossible, shoulders will be formed on the commutator where the brushes do not rest all the time, A and B, Fig. 2. This is especially the case where the brushes are not staggered. When the shaft oscillates with end play which should be ⅛ to ¼ in. for even wear of the bearings the shoulders will lift the ends of the brushes, breaking the contact, causing vicious sparking and fluctuating voltage on the line.

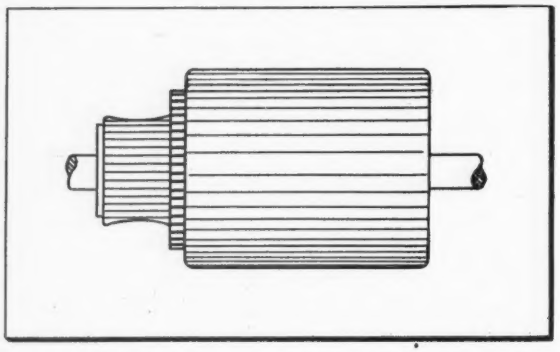


FIG. 1. COMMUTATOR NOT STRAIGHT FROM END TO END

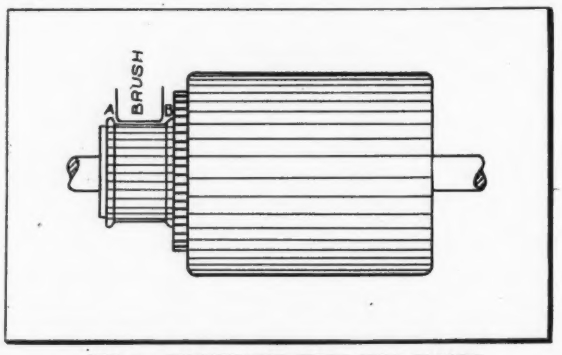


FIG. 2. COMMUTATOR WORN INTO GROOVE

Sparking from the above causes varies in color from white to green or red and is injurious to commutator, attacking copper and mica alike. Excessive side play may be caused by the machine's not being level or by the belt oscillating from one side of the pulley to the other. The shaft will lie to one end of the bearing for a period, then suddenly throw itself toward the other end of the bearing lengthwise of the shaft. This will, depending on the amount of side play, cause a certain amount of fluctuating voltage on account of varying strength of field. Often the voltage fluctuation from this will not be over an excessive range, but is annoying. If there happen to be ridges on the commutator due to wear there will be excessive voltage variation. Take a block of wood, and while watching the voltmeter,

press the block on alternate ends of the shaft. You will get a good idea of the losses due to this cause, fluctuating voltage, in addition to general annoyance, flickering and bad effects on machinery, also lowers the output of the machine and tends to cause sparking by induction, in the armature. The writer saw a case of a d.c. machine used as an exciter that fell off to 80-volt capacity. By regulating the end play and filing off a very light ridge, the voltage was brought back to 130. Dirt or copper dust and chips between the brush and the commutator will cause a red or greenish spark to appear to emerge from the brush and follow the commutator for a distance of 3 or 4 in. This will cause grooving of the commutator. The commutator may be sprung from the effect of centrifugal force on the armature. This is called an eccentric commutator. It might possibly be remedied in some cases by turning down, but as it is worse when running at full speed, it should be sent to the shop if possible, to have the armature and commutator reset and rebound. We should note here that the speed of a prime mover or generator should not be below normal nor over 10 per cent above, the speed should be uniform, and the belt must not slip or have bad joints. The machine must be on a solid unyielding bed, must have no vibration and the belt must run true. The shaft must be level.

Dynamos are designed on the basis of a certain speed, and the designer does not allow for engines whose governors are not kept in proper adjustment. An engine governor for electric service should regulate to within 2 or 3 per cent of rated speed. There should be no bad joints in the belt. Too much vibration due to high speed or a poor foundation will jar the brushes from the commutator and cause rows of blue or white sparks to appear along the edge of the brush. A spark of this kind and color is not as dangerous as others. Sparks will appear continuously.

A sprung shaft will cause jarring which has a bad effect on the brushes and will also cause disturbance of the field, and it will be hard to find a neutral position for the brushes. We must remember to distinguish between a sprung shaft and an eccentric commutator or armature. The effects are somewhat alike. A worn bearing lets the armature nearer one pole than another and distorts the field the same way a sprung shaft does, when the shaft is loose in the bearing.

When a commutator is worn out it is often found impossible to set the brushes at the right angle because the brush holder can not then allow for proper adjustment for the difference in an arc of contact as it gets nearer the shaft. This results in chattering and sparking. The idea in getting the angle of the brush is to set the holders in such a position that the force exerted on the brushes by the commutator will be in the direction of the force exerted by the tension spring and without friction in order that the spring may easily force it to its seat.

To obtain a polish on the commutator put a little extra tension on the brushes for a short time and a slight amount of mineral oil to keep the surface lubricated. As no sparking occurs without a current it might be well to run with the machine "dead" until a polish is started. Also be sure to keep dirt and copper dust off of the face of the brush.

In smoothing a commutator sandpaper may cut the mica and copper at different rates. In this case we use a block of sandstone, as this is unyielding and will cut one as well as the other.

If a commutator happens to be damp the centrifugal force may throw it out of true. In this case it should be tightened, trued, and rebaked. Dampness also lowers the resistance of the armature insulation. Bake or dry out by using not over the full load current of the machine. Any load desired can be obtained by the use of an adjustable water rheostat. Small machines can get enough load by using a lamp bank. When using water resistance be sure to remember that its resistance changes as the temperature changes. Dampness will cause an armature to heat on any load or no load. Short circuits between commutator bars, due to carbonized oil or dirt, will cause heating of the commutator and the armature. Shafts of electric machines must be rigid on account of strains due to weight balance, speed and magnetic pull.

Too high speed and imperfect balance will cause vibration. Commutators when new sometimes require tightening of the bars, etc., while breaking in and while adjusting themselves to conditions of load, speed and drying out. Keep the face of the bearing end of the commutator clean and protected with varnish. Don't have any voltage on the machine while turning down a commutator, and have the brushes removed. If using a grinding arrangement for turning, run at approximately full speed, in order to allow for any usual disturbance of the commutator by centrifugal force. If truing in a lathe run on slow speed and use a diamond point tool. The commutator must then be sandpapered and polished.

High speed gives a good polish but it is more apt to throw sand and copper dust into the armature and field.

Turn the inside corner slightly round as at C, Fig. 3, so that dirt and oil will not be so liable to collect and cause short-circuited bars.

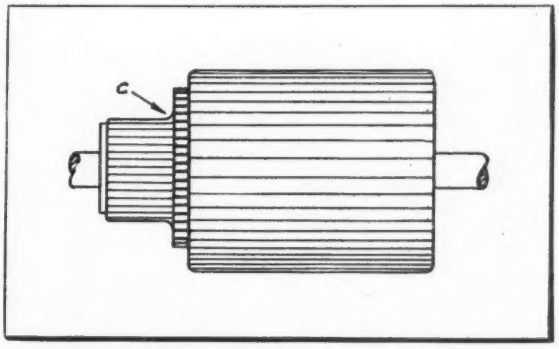


FIG. 3. ROUNDED CORNER OF COMMUTATOR

When turning a commutator on a motor use a water resistance in series with the armature to obtain slow speed. A short-circuited or open armature coil, by changing the strength of the current, as a brush is carrying from different bars, will spark, which is harmful and which will cut copper and mica.

There must not be dampness, excessive temperature due to atmosphere or too warm bearings, or too much heat due to overloads as they all affect the commutator and allow the centrifugal force to harm it. There are tools in the market for turning a commutator while in position with a lathe tool and flexible shaft, or by a separate motor for grinding by use of a flexible shaft and also for undercutting mica. Consult electrical manufacturers. Portable turning tools are generally used by fastening them to the machine bearing bolts. If they are not long enough longer ones may be used

temporarily. Motion for grinders is usually obtained by a soft wheel which rides on the commutator. Use a coarse grinder first, then a finer one and finish with 00 or 000 sandpaper. Take a stick of wood and bear on the commutator while stationary to see if any of the bars are loose.

To see if the armature is equally spaced between the pole faces, take a thin wooden wedge with a long taper. Place it between the armature and pole face and mark it to show how far it enters. Then measure the rest of the poles and see if all have the same space. Do this at both ends of the armature.

If a generator is overloaded it will drop its voltage. A motor will lose speed. An open-circuited armature coil may not show when stationary, but when revolving the centrifugal force throws the leads out if they are near the commutator and a ball of fire may be seen all around the commutator where they touch each other or the commutator. Of course there may be an open-circuited coil without these effects as the wires may not be in the right position to touch. This sparking is dangerous as it burns the mica and copper and may also short-circuit and burn out a coil.

Low voltage causes a weak field—as this may occur at the time when the machine is carrying a heavy current the armature reaction is great in proportion and is apt to cause a heavy spark. A field may have loose connections, a short-circuited coil, or a reversed coil. In any of these cases there is apt to be excessive sparking. If one field coil is weak or short-circuited the fact will probably be noticeable by the remaining good coils running unduly hot.

(To be continued.)

OVERHAULING A SERIES MOTOR

By C. R. Weihe

THE motor under discussion had been pretty well saturated with water, both the field and armature winding; the process of this saturation had no doubt been taking place for some time; of course while the motor was not in use, and abandoned.

Having agreed to put it in satisfactory operation, I tested for grounds while the motor was in this condition and the results were that the insulating resistance was very low.

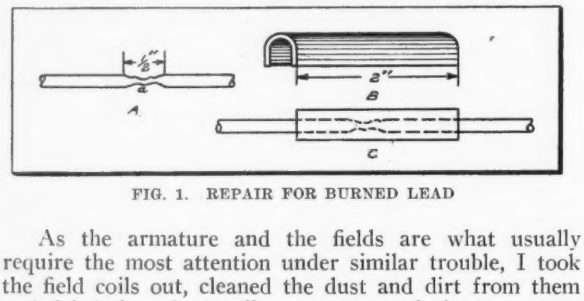


FIG. 1. REPAIR FOR BURNED LEAD

As the armature and the fields are what usually require the most attention under similar trouble, I took the field coils out, cleaned the dust and dirt from them and dried them by sending a current of about 30 amp. through them in series for 3 days; from time to time I tested the drop across the 4 coils to ascertain how the drying process was proceeding. When first connected, the drop across the 4 coils was about 8 volts with a current of 31 amp., and for the next 12 hr. the coils heated very little, but the drop was a little more than 8 volts with the same current, this probably being due to the temperature coefficient of the copper.

After the first day the coils began to warm up considerably, but at no time did they get any warmer than 150 deg. F. (the work being done in winter with the temperature of the drying room only a few degrees higher than the outside temperature, say about 45 deg. F. as an average).

The last day of drying, no ground would show when tested with a low reading voltmeter, and the drop across the 4 coils showed 11 volts with no change either up or down; by this I judged the coils dry and disconnected them, then varnished them with waterproof insulating varnish.

After the coils were dry from the varnishing, they were placed in a row and connected up in series to ascertain the correct connection to make so the fields would

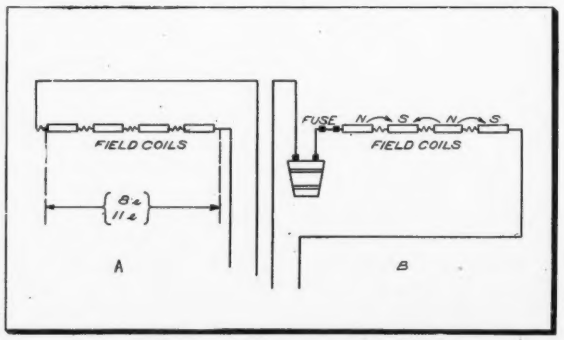


FIG. 2. DRYING COILS AND TESTING POLARITY

alternate in polarity when connected up in the motor; after the coils were properly arranged they were placed in the motor (enclosed type G. E.) which had been cleaned, dried and varnished also.

An extra armature was on hand which we placed in the motor for the purpose of trying out the fields, with a crude water rheostat, consisting of a bucket of water and 2 iron plates, we started the motor and, satisfied that the fields were all right, I turned my attention to the old armature which had been dried during a couple of weeks, before a fire. Of course the armature could have

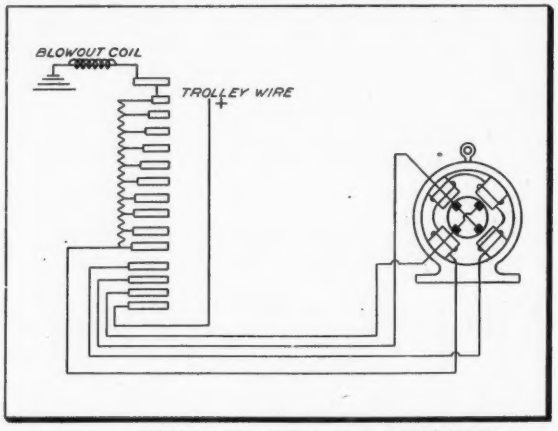


FIG. 3. MOTOR AND CONTROLLER CONNECTIONS

been dried by sending a current through it the same as the fields, but I did not deem this necessary as the armature appeared perfectly dry by testing for insulating resistance with a low reading voltmeter.

The armature appeared to have a coil burned but the insulation was not charred or even dry and crisp.

By sending a current through the armature and measuring the drop from bar to bar, I was satisfied there was no open or short circuit in the armature (also no ground) as the drop was the same from bar to bar.

The burned coil lead was fixed as follows: In Fig. 1 A shows the lead with the cross-section shown at a reduced to about the size of No. 12 wire. As I was desirous of saving the work of rewinding the armature or putting in a jumper, I took a piece of copper about 1/32 in. thick, ¾ in. wide and 2 in. long, which I tinned and then bent in the shape shown at B, filling this nearly full of solder.

I next tinned the wire A and placed B over A as at C and heated B until the solder melted, then stuck to A, which made an excellent connection. I then taped the lead and varnished it. If the connection at C ever becomes hot enough to melt the solder and burn A in two, the arc will weld the 2 ends to B, still completing the circuit.

When put in operation, the motor worked satisfactorily, the company's engineers having figured that it was to haul 12 pit wagons up little more than a 10 per cent grade 2200 ft. long. On a test and to satisfy myself that the lead C would give no trouble we pulled 17 pit wagons at top speed up the grade.

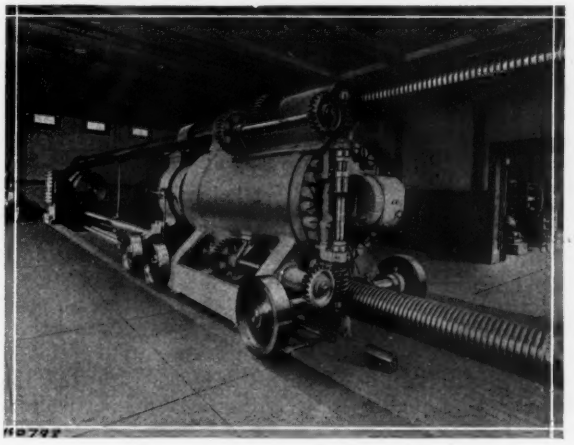


FIG. 1. PRECISION TESTING MACHINE WHICH INDICATES THE PRESSURE OF THE FINGER OR 2,300,000 LB.

Figure 2 illustrates the method of drying the coils (A) and testing for polarity of the fields (B).

As the motor operates in the mine and since all mines are more or less damp, I protected the resistance and fields from excessive pressure connecting them up as in Fig. 3. This manner of connection also protected to a certain extent the blowout coil on the controller as the line to which this motor was connected was a ground return system.

LARGE PRECISION TESTING MACHINE

ILLUSTRATIONS show views of the testing machine that has recently been installed at the U. S. Bureau of Standards, Washington, D. C. This machine is used for testing columns, blocks, beams, girders, and other shapes of steel, iron, wood, concrete, reinforced concrete, etc., in order to determine the breaking strength, the spring under load, and other valuable engineering data. It is able to take specimens of any length up to 34 ft., and can exert a pull of 1,150,000 lb., or a crushing force of 2,300,000, and yet so delicate is it that the pressure of the finger upon it will be registered.

The machine consists of 2 main parts connected by 2 enormous screws. One part is stationary and contains the mechanism by which the force exerted on the specimen is measured. The other part, called the press, is movable and consists essentially of a hydraulic cylinder mounted on wheels. It will be noted that the head of the hydraulic piston is mounted on wheels of its own and can move independently of the cylinder. The oil, which is used to produce the hydraulic pressure, is supplied through a pipe which telescopes or elongates as the press is moved.

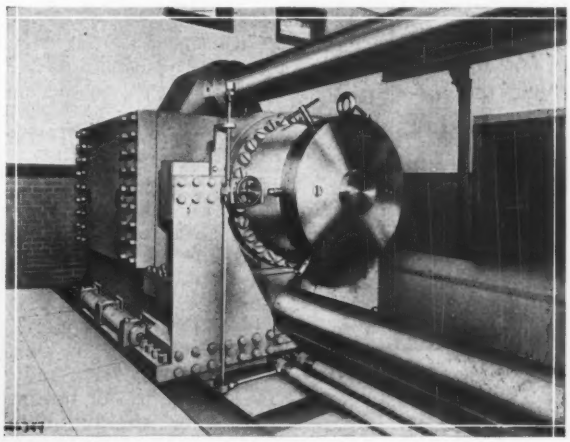


FIG. 2. STATIONARY END OF TESTING MACHINE

In testing, the press is moved to the proper point, depending on the size of the specimen, by the Westinghouse motor seen in the photograph. The specimen is then put in place, being gripped by jaws mounted on each of the ends of the testing machine if it is to be put under tension, or held between 2 heavy plates if it is to be compressed. The hydraulic piston is then slowly

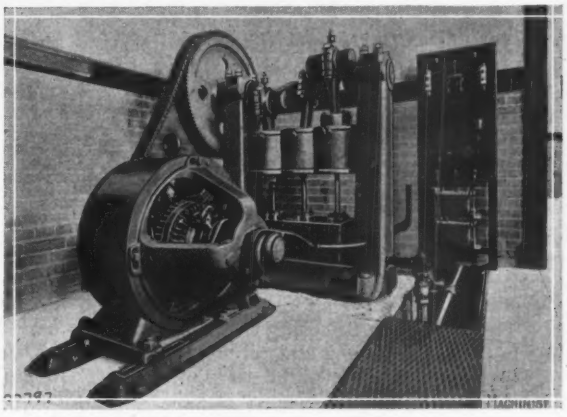


FIG. 3. PUMP WHICH SUPPLIES PRESSURE

forced forward or pulled back, depending on whether the test is of compression or tension, until the specimen under test is ruptured.

Figure 3 shows the Deane pump driven by a 20-hp. Westinghouse motor which supplies the oil for operating the hydraulic cylinder. This pump is capable of delivering oil at a pressure of 3500 lb. per square inch.

THE NEW POWER PLANT at the insanse hospital at Jamestown, N. D., will be one of the largest of its kind in the state and will cost $56,000. The building is to be completed Dec. 1 and will supply heat, power and electric light to all the buildings of the hospital.

ELEVATORS, CARE AND OPERATION

Hints as to Keeping Machinery in Running Order and Handling Cars Safely

THE following applies to modern elevators with automatic stop devices and with automatic acceleration control for stopping and starting.

First, when the elevator is out of service, always keep the operating device whether a switch lever, a hand wheel, or a rope in central position. When driving the car move the operating device to the extreme up or down position as the controller will automatically bring the car up to proper speed. If the elevator fails to start when the operating device is moved to its full travel, throw the operating device to the center position and look for open circuit at the main line fuses and look over all automatic switch contacts. Also examine the machine bearings, gears and thrusts to see whether they are dry or hot from lack of oil.

To stop the elevator when it is in motion, move the operating device to the center when the car is close to the floor level. If the elevator fails to stop, under these circumstances, let it travel to the top or bottom of the shaft as the case may be, where the automatic devices will bring it to rest. Then go over the machinery to find the cause of the trouble. If the car stops suddenly when descending, throw the operating device to center and have the engineer in charge examine the machine to determine the trouble. If the safety device has operated be careful to see that slack rope is taken up on the drum and that the cables are not crossed on the drum or out of the proper groove before releasing the safety. Never attempt to leave the car while it is in motion.

Keeping the Machinery in Order

MOTOR bearings for electric elevators have automatic feed rings which should always turn with perfect freedom; the oil chamber should have enough oil to insure the rings dipping into it yet the oil should be a little below the bottom of the shaft. Use only motor bearing oil.

For worm gear lubrication use only the worm gear lubricant and keep the chamber filled to a point just above the center of the worm shaft. When it is necessary to remove sediment and grit, drain the oil from the gear case; this should be done at least 3 or 4 times a year and the chamber filled with fresh lubricant. The worm shaft bearings are automatically oiled from the worm chamber and oil should be allowed to drip slowly through the gland to insure perfect lubrication of the bearings. Square braided flax packing should be used in the worm shaft stuffing box and the gland adjusting nuts must be tightened evenly to prevent binding the shaft.

The drum shaft bearings should be oiled every day and all parts of governor kept well lubricated so that they work freely and easily.

Compression cups on the vibrator sheaves should be kept filled with compression cup grease, also the overhead sheave bearing boxes be packed with the same grease. To prevent rusting cables should occasionally be coated with cable preservative applied with a brush.

Examination should be made of all safety devices in the car frame and car at freqent intervals and all parts kept clean, well lubricated and free from rust. All parts of the controlling device should also be kept well lubricated so that they work freely and easily and the metal and carbon contacts on the controlling device should be kept clean and free from pits and blisters. They should be frequently smoothed with sandpaper but never use emery cloth. The brake springs should be properly adjusted to hold the load, the brakes just clearing the pulley when released. A piece of thin paper passed between the shoes and the pulley shows a sufficient clearance and both pulley and the brake shoes must be kept dry and clean; under no circumstances put oil on the brake pulley. When necessary to remove brake shoes for cleaning or repairs, the empty car should be left at the top landing with the counter weight secured blocked up in the pit.

Frequent trial of the car on the automatic stops should be made to see whether the collars are acting properly as the automatic may be thrown out of adjustment by the stretching of the cables. These collars should be set so that car will stop level with the top landing with normal load and level with the bottom landing when empty. The cover of the automatic stop switch should be removed and thoroughly cleaned frequently.

In adjusting or renewing brushes they should be fitted with full bearings on the commutator with a strip of fine sandpaper; never use emery cloth. This fitting is done by placing the paper between commutator and carbon with sand side against the carbon and drawing it back and forth by hand, keeping the sandpaper always close against the surface of the commutator. Good and frequent fitting in this way will do much to prevent sparking. The carbons should always project beyond the holder so that the holder cannot bear on the commutator and brushes should be staggered to distribute the wear evenly on the commutator. Brush springs should be so adjusted so as to insure good contact between carbons and commutator.

In case the commutator becomes rough, it may be smoothed by holding a piece of fine sandpaper against the surface while the machine is running, after which the commutator should be wiped clean, using a canvas pad. Never use emery cloth on the commutator and never use waste to clean it. The commutator should be kept free from dirt and oil by polishing when new with canvas after being sure that brushes are at neutral point and properly bearing on the commutator. This will give a fine blue finish which improves commutation. The head of the commutator and the mica insulating ring at the base of the bars as well as the surface of the commutator should be kept free from dirt and oil. The information and instructions in this article were furnished by the Otis Elevator Co.

ANNOUNCEMENT WAS MADE recently of the Alabama Electric Co., the Wetumpka Power Co., the Alabama Power and Electric Co., and the Alabama Development Co. with the Alabama Power Co. The joint agreement of the companies in the merger authorizes the Alabama Power Company to issue $20,000,000 worth of bonds. It is understood that this money is to be applied to the development of the water power projects owned and controlled by the Alabama Power Co.

The Alabama Power Co. now controls 430,000 hp. on the Coosa River, 400,000 on the Tennessee River, 115,000 on the Tallapoosa River, 52,000 on Little River, 6000 on Sautty Creek, 7000 on Town Creek and 2000 on Choccolocco Creek.

IT IS NOT the spurt at the start, but the continued, unresting, unhasting advance that wins the day.

FOREIGN DEVELOPMENT IN THE POWER PLANT FIELD

Progress of the Employment in Germany of Coal Tar Products for Heating, Lighting and Power

By J. H. Blakey

USE of coal tar products is being greatly developed in Germany; in 1910, 29,000 tons were utilized for heating and 400 tons for the production of power. This consumption is, however, far from having reached its maximum, as of the 1,380,000 tons annually produced, 1,200,000 tons can be distilled.

The cause of this development is to be found in the quality of these oils, and the advantages given by their use, which may be summarized as follows:

Transformation as complete as possible of the energy contained in the oils into force; employment simple and economical; facility of transportation and storage; suppression of smoke by complete combustion; native production, assuring to Germany fuel independence in time of war; high calorific power, and small proportion of ashes and sulphur.

The principal difficulty which has had to be met was the construction of suitable appliances, and especially burners. The first burner was an atomizer working by air pressure or centrifugal action; it had the defect of requiring the addition of an air pump. Soon a number of appliances appeared which would work as well with compressed air as with steam. The illustration gives the details of a burner using oil or naphthaline* for the heating of boilers, metallurgical furnaces, caldrons for the distillation of tar, etc.

The first experiments made upon steam boilers gave the following results: 1 kg. of coal vaporized 6.5 kg. of water; 1 kg. of oil vaporized 11.4 kg. of water, this is equivalent to 1 lb. of coal vaporizing 6.5 lb. water, 1 lb. of oil vaporizing 11.4 lb. water. Now, with improved burners a vaporization of 13 kg. of water has been reached. The atomization of the kilogram of oil requires 250 liters of compressed air or steam, so that

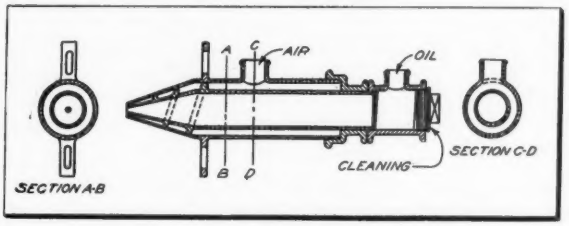


FIG. 1. BURNER FOR HEAVY OILS

the useful effect in relation to the combustible employed is from 82 to 90 per cent with oil, and from 72 to 73 per cent with coal. With coal at 25 francs ($5) and oil at 56 francs ($11.25) per ton, and taking into account the advantages of transportation and storage, and the absence of smoke, there results a considerable economy in the use of the liquid fuel.

Notwithstanding this its use for heating boilers is not yet very general; it is, however, being used in ships, and especially in the torpedo boats of the imperial navy. Some railroads, also, have made experiments with a view to using it for locomotive boilers, but up to the present time these heavy oils are mostly used for heating metallurgical furnaces. In a gas furnace which was used to reheat steel tires, it was found that a ton of steel could be heated from 800 deg. C. to 1450 deg. at a total cost of 4.7 francs. With the substitution of oil to replace the gas the cost was found to be 1.85 francs. In a furnace of 4 crucibles for the melting of iron, when coke was used the cost per ton of metal was 6.5 francs; with heavy oil this was reduced to 2.4 francs.

It is known today that in metallurgy the chemical action (oxidizing or reducing) of the flame of the furnace is of great importance in the quality of the products obtained. This condition, which is difficult to regulate with coal or coke, is obtained at will and easily with heavy oil. This point is of special importance in the fusion of copper, and it has caused the adoption in that industry of heating with heavy oil.

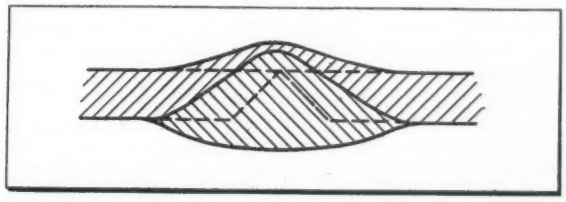


FIG. 2. JOINT SOLDERED BY AUTOGENOUS PROCESS

Coal tar oil is also used for power in motors of the Diesel kind. It is Diesel who has solved the problem of the combustion of gas under the strong pressures of air used in these motors; the work of Rieppels has completed the solution of the problem from the point of view of the ignition of the various hydrocarbons.

The first coal tar motor was brought out in 1905 by the house of Sulzer of Ludwigshaven. A mixture of a lighter oil was necessary to insure ignition, consequently the 2 combustibles were injected into the combustion chamber of the motor by a pump. Now the improvement in the motors has rendered the addition of this lighter oil unnecessary. The heavy oil is injected under a pressure of 60 atmospheres into the ignition chamber, which has a temperature of about 500 deg. C. The use of a special device avoids the cooling which was caused by the introduction of the air in the old motors, and which made the use of the lighter oil necessary. Researches are being carried on and improvements are constantly being made, so that now the properties of this combustible are well understood.

The oil reservoir is furnished with a serpentine heater which prevents the deposit of solid naphthaline or other hydrocarbons. The parts of the motor which are in contact with the combustible are of 25 per cent nickel steel or of pure nickel, and are thus saved from corrosion. All parts of rubber are replaced by asbestos. Naphthaline is also used for the production of power; the house of Dentz in Germany is now turning out these motors regularly.

Use of another coal tar product, benzol or benzene (C_6H_6) is becoming more and more general for explosion motors. This combustible can be used in ordinary explosion motors; it is sufficient to alter the admission, as gasoline requires 16 to 19 parts of air for complete combustion, while with benzene the proportion is 1 to 22. An economy of 35 per cent is claimed for the employment of benzene in these motors.

*Naphthaline is a benzene hydrocarbon (C_{10} H_8) soluble in alcohol and in ether, but insoluble in water.

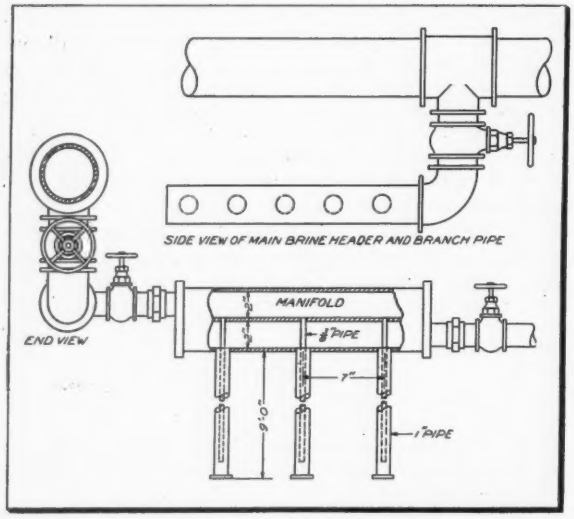
In the autogenous soldering industry, an oxybenzol burner is used for the soldering and cutting of metals; one kilogram (2.2 lb.) furnishes about 10,500 calories of heat at a cost of 28 centimes (5.6 cents). To get the same quantity of heat with an oxyacetylene burner would cost 1.25 francs (25 cents). Benzene is also used in many lighting appliances. The Fernholz lamp, in which gasified benzene is used, has a lighting power of 3000 Hefners† (One Hefner is 0.88 of a British candle). It is started by heating the burner with a small quantity of alcohol. Its cost is 3 to 6 centimes per hour per 1000 Hefners (7 to 14 mills per 1000 British candles per hour). Finally, it will be remembered that some coal tar products, such as naphthaline and anthracine‡, form the basis of many coloring agents.

NOVELTY IN PLATE ICE FREEZING

By William S. Luckenbach

At the absorption plant of the Atlantic City Central Freezing Co., Atlantic City, N. J., the following novel method of making ice is in use, the details being furnished to the writer by the courtesy of the engineer, Matthew Dix.

Originally, this plant was a can system, and afterwards was changed to the regular plate system; recently the present method has been installed, which the company claims is superior to either of the others. The generators are in 3 units, with total capacity of 150 tons, and require about 15 tons of aqua ammonia for



ARRANGEMENT OF HEADER, BRANCH AND MANIFOLD

a charge. Liberation of the gas is accomplished by using the exhaust steam of the necessary adjuncts, including an engine for generating electric power, at a back pressure of 15 lb.

Rich liquor enters the generator at 28 deg., and poor liquor enters the absorber at an average of 21 deg. F. The liquid anhydrous enters the expansion valve under a pressure of 160 lb., is 99 per cent pure and shows a temperature of about 62 deg. F. The generators are of the ordinary horizontal type, and steam boilers are horizontal return-tubular, with automatic stokers, having an average fuel consumption of 11 tons. Condensers are of the atmospheric type, taking cooling water at 78 deg.

Water to be frozen is taken from an artesian well, and after being filtered, flows into the freezing tank. The freezing is accomplished by brine circulation at 0 deg., the brine flowing through a header which extends the entire length of the tank, supplying sections consisting of a system of 5 pipes each, as indicated in the diagram. This insures a fairly even distribution of temperature, as each pipe from the 5-pipe system enters a 4-in. square cast-iron manifold, extending across the tank. Through the middle of this manifold is a cast partition, leaving 2 in. of space above and 2 in. below the division. In this partition are holes for inserting ⅜-in. pipe, spaced 7 in. centers, and in the bottom of the manifold, just below each hole in the partition, is a corresponding hole tapped for 1-in. galvanized iron pipe, these latter pipes extending to the bottom of the tank.

The lower end of each 1-in. pipe is closed and a ⅜-in. tube from the division extends into it like a porcupine boiler tube. Brine passes into the upper chamber at one end, down the ⅜-in. pipe, out of the end and up the 1-in. pipe, taking up heat from the water to be frozen and passing out through the lower chamber to the return header.

When the ice is 11 in. in thickness, that is 5½ in. each way from the center of the pipes, it is lifted out with a power crane by uncoupling each end of the cast-iron manifold and hoisting. Before sawing and while standing vertical, the manifold is again connected at both ends and warm brine allowed to flow through the pipes until they are free from the ice, when the manifold is disconnected and pipes are hoisted clear of the ice and returned to the tank. The block is then ready to be sawed.

This method leaves, of course, holes the entire depth of the block, 9 ft.; but the ice is exceptionally fine and requires 48 hr. to freeze. Each 5-pipe section from the main header has a controlling valve and also each pipe leading to the freezing manifold has a valve so that any single manifold or an entire 5-pipe section can be cut out without interfering with the working of the balance of the plant.

The tank lids are in one piece across the width of the tank, made wide enough to cover 3 of the 4-in. square manifolds. In the writer's judgment this arrangement could be improved by exposing less of the water being frozen to the surrounding atmosphere.

In recent German tests, reported in the A. S. M. E. Journal, of materials for turbine blades to be used with superheated steam or gas, it appears that wrought iron fell from a tensile strength of 52,600 lb. at ordinary temperature to 18,400 lb. at 932 deg. F., according to Kollman, but at 752 deg. F. had a strength of 45,500 lb. and elongation 40 per cent according to Rudeloff, so that it is considerably used. Some special bronzes gave good results up to 662 deg. F., one, Durana metal, being 59 per cent copper, 40 zinc, 1 tin, 0.4 phosphorus and 0.3 iron. In steel alloys, low carbon shows better results than high. Five per cent nickel steel was good but 25 per cent not so good by one investigation, but Guillet recommends as a result of many tests, 30 to 32 per cent nickel and not over 0.12 per cent carbon as being durable, having small expansion and being free from rust in clean water. Monel metal, with 68 per cent nickel and 27 copper, the rest iron and manganese, is good, but so hard as to be difficult to work, but with 65 per cent nickel the metal is softer and at red heat malleable, and after being heated to redness does not oxidize further.

†The Hefner is the light standard used in Germany. It is the amount of light given by an amyl acetate lamp, with a wick of standard dimensions of a flame 40 mm. in height. It is also used as a light standard in France, under the name of the bougie decimale.

‡Anthracine is a hydrocarbon (C_{14} H_{10}) which is the principal base from which the valuable coloring matter alizarin is prepared. It forms white crystalline flakes which melt at 415 deg. F.

LETTERS DIRECT FROM THE PLANT

Cash Paid For Ideas Accepted. Sketches Desirable.
We Make The Drawings

INDICATING PUMPS

AMONG the interesting uses of the indicator is on a deep well pump. The accompanying cards are from such a pump with steam cylinder 10 by 36 in., pumping from an artesian well 405 ft. deep. It must be remembered that these pumps have to have some method which will give a uniform stroke both up and down. As the plunger weighing 1400 lb. is the unbalancing feature, the method of controlling this stroke is accomplished by compression or choke valves which choke the exhaust steam as it passes out of the cylinder, thereby keeping the pump from going faster on the down than up stroke regardless of the steam pressure or excessive weight of the plunger. The choke or compression valves can be set so that they almost stop the pump and when set properly are nearly closed, which causes excessively high back pressure, and must be kept so, else at times when the plunger goes down the piston will strike the bottom head with a most dangerous thud.

A glance at the Fig. 1 will show the pump card running in normal condition, as this enormous back pressure is necessary in order that the pump will work without jar and in case it loses its water by the well's getting dry, it will not jar itself to pieces. The card shows that it takes 65 lb. of steam to push this plunger

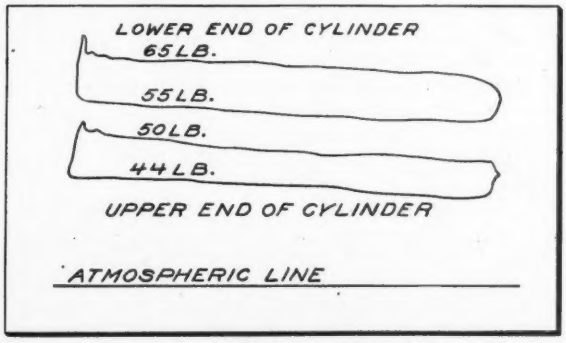


FIG. 1. INDICATOR DIAGRAM OF DEEP WELL PUMP IN NORMAL CONDITION

up, having a back pressure of 44 lb. on top of the piston, and in pushing down it takes 50 lb. and the additional weight of the plunger, which is 2042 lb. to push against 55 lb. back pressure in doing its work. This seems wasteful and it cannot be helped because these pumps are liable to lose water any time and hammer to pieces.

A glance at these figures will show that since the pump is vertical double-acting that if it takes 21 lb. mean effective pressure, which is net pressure between 65 and 44, to do the work on the up stroke, that if we make the back pressure on the down 44 lb. like the up stroke, the difference or 11 lb. back pressure would make the mean effective pressure required to push the piston down 39 lb. instead of 50 lb., which subtracted from 65 lb. required on the up stroke would leave 26 lb. as the difference required, which multiplied by the area of a 10-in. cylinder, 78.54 sq. in., would give 2042 lb. as the dead weight of plunger and reciprocating parts which from my knowledge of other deep well plungers and their weight is reasonable.

I am showing 2 cards from a duplex boiler feed pump which I have taken to see how much difference in mean effective pressure is required to feed a boiler with the help of 60 lb. of city water pressure in the water end suction of pump, also how much mean effective pressure is required without city pressure or when the pump is taking water from an ordinary receiver at atmospheric pressure.

The plant from which this test was taken carried only about 55 lb. of steam which was sufficient to run the engine. Figure 2 was taken while the pump was

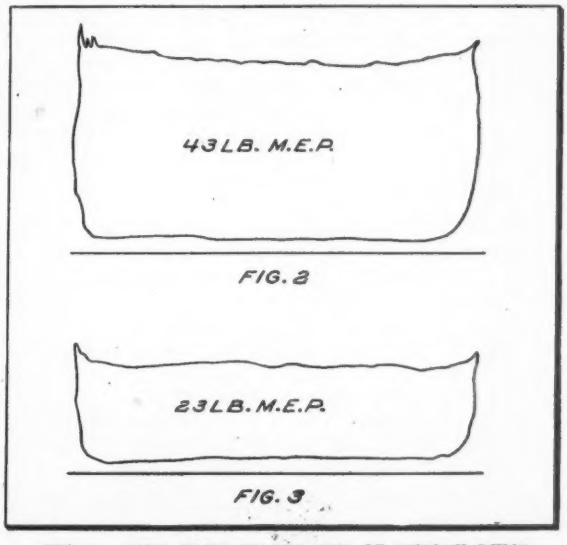


FIG. 2. CARD FROM WATER END OF DUPLEX PUMP
FIG. 3. CARD FROM WATER END OF PUMP SUPPLIED WITH CITY WATER

taking water from the receiving tank and of course had to push against the boiler pressure of 55 lb. and required, as shown, a mean effective pressure of 43 lb. A steam gage attached to the air valve on the water end registered 88 lb. as discharge pressure.

Figure 3 was taken immediately afterwards by changing over to city pressure of 60 lb. and it required only 23 lb. mean effective pressure to get a discharge pressure of 88 lb. on the water end.

These cases present an argument as to whether the return water is worth the extra mean effective pressure which the cards show is required to pump it. The plant in question can be fed by city water pressure, as the steam pressure is below it, but does

not go in quite fast enough at times. When we consider the steam consumption of duplex pumps, which approached 100 lb. of steam per horsepower per hour, it is cheaper to utilize the city water pressure on the pump that uses the 23 lb. mean effective pressure. In the above case the feed pipe was reduced from 1½ in. to ¾ in. at the pump discharge, which accounts for the 88 lb. required, but the cards' mean effective pressure holds good as showing the difference in mean effective pressure required to pump against 88 lb. either from receiver or with the help of city pressure.

The best way, I think, would be to run the pump discharge pipe into the receiving tank in the shape of a coil, and then out to the boiler feed line through the heater into the boiler. By this arrangement the feed water will be heated before it goes to the heater and the heat from the return water will then be utilized after which the return water in receiver can go to waste, for in most cases it has caused untold trouble and worry because of its being impregnated with cylinder oil. By this method the boilers will be getting good oilless water at the same time the feed pump will be pumping with the 23 lb. mean effective pressure instead of 43 lb. as when taking from a tank, and the feed water will be heated to its maximum temperature even if the city water comes in at a low temperature because it will be passing through 2 feed-water heaters.

A. C. Waldron.

ENGINEER'S LICENSE IN MASSACHUSETTS

I HAVE read several letters in Practical Engineer at different times from men who failed to pass the examination for a Massachusetts engineer's license. Now, I want to make a few remarks that will perhaps indicate to these men why they failed to pass. Please bear in mind that I have been through the mill and have held a first class engineer's license since 1907, and what I say here I sincerely believe to be the truth.

I was firing a steam yacht out of Boston in 1895 when the State license law was passed and at the end of the season when I came ashore I applied for a third class engineer's license. Men were being examined wholesale at that time. I was not called up till Jan. '96, and the best I could get after an hour's quizzing was a license to fire under a boss fireman or engineer. Mind you I had already had over 6 years' experience in sawmills, hotels, steam vessels and locomotives. Naturally I felt sore, but I determined to have the best license to be got in Massachusetts. I went to studying and after 16 months I tried again and got turned down.

I then went to work in another district and under a chief engineer who took an interest in his men and helped them to study to advantage. In June, 1897, I obtained (after a thorough, practical examination), a first class fireman's license, and a little less than 3 months later the same examiner put me through the paces and awarded me the 3rd class engineer's license I had tried for nearly 2 yr. before.

In September, 1899, I applied for second class engineer's license and in the meantime several engineering schools had opened for business in and near Boston and the first question fired at me was "What school have you attended?" My answer was "experience." I got the second class engineer's license limited to noncondensing engines.

In May, 1901, I tried for first class engineer and got only the straight second class with the noncondensing limit removed. In May, 1902, I again tried for first class and got turned down. I appealed to the board and had the same answer handed to me, and, mind you, I had been working my fool head off every minute I could get trying to learn all there was to know about steam boilers, pumps, engines and other steam apparatus; so I naturally began to wonder where the trouble was. I soon got the answer.

A good friend with whom I was discussing the matter said: "Bill, I will tell you where you are in wrong if you will not get mad. The thing that is keeping that license out of your frame is booze. So-and-So has seen you once or twice with a pretty good skinful and until you get right you will never get any better license."

But I said, "I never take a thing in the morning nor on the job. The only time I ever touch a drink is after I get all done work at night and away from the plant."

"That may be and lucky for you, you know, or if you don't I can tell you straight, that So-and-So and Such-a-one (naming 2 local State inspectors), are after your ticket the first time you give them a chance; so watch out and quit it."

Well, to shorten the story, I followed his advice after a fashion. I moved into another part of the state and in 1903 I tried again for first class engineer. No use, nothing doing. I got disgusted then and moved to another state where I stayed for over 2 yr. and kept sober, had the typhoid fever and got thoroughly cleaned out and rejuvenated.

In December, 1906, I came back to Massachusetts and tried again with the same inspector who threw me down in 1903; same old story.

Then I said, "Mr. Blank, when you turned me down over 3 yr. ago, I know why you did so; but I am a different man now and can prove it. I have also had experience on a first class up-to-date plant since then and am entitled to my first class engineer's license."

He smiled and said: "Is that so? Well, appeal if you wish or come again in 90 days."

I said: "Watch me until I do come again, and if I don't get that license then I shall appeal and keep trying and appealing every 90 days until I get what I am after."

"Well, that's your privilege," said he, and smiled again.

I joined the N. A. S. E. in January, 1907, and got in with a clean crowd of engineers and in September, 1907, I had applied for examination and was notified to appear at 9 a.m. on a certain day. I was there on time, at 9:30 the fun began and from then till noon we had a warm time, Mr. Inspector and I. He let up on me at noon and said: "Be back at 12:45 and I will finish your case."

"I hope I shall never have to put in another afternoon like that one; but at 6:15 he finally said: "Sit down here a minute." After looking over a few letters he turned to me and said: "Did you ever have any boiler or engine accidents that you could have prevented?"

I said: "No, and will defy you or any other man to point to a case of carelessness or neglect on my part or name an instance where I have ever had any trouble except 2 hot crankpins, the result of keying too tight, and I cooled those off after stopping and slacking up on them while running."

He said: "How long have you followed the business?"

I answered: "Eighteen years in November."

"Well," he said, "you win your first-class engineer's license today; you've earned it. Now let me give you a tip. Let booze alone. You could have had this ticket 5 yr. ago if you had kept going as straight as you were up to August, 1902; but I guess you know that by this time. Your record is in every inspector's office in Massachusetts, not only yours but about 100 more. We issue a license and a complaint comes in that the man is either incapable of performing his duty as an engineer or is neglectful or not trustworthy and we begin to keep tab on him, particularly a man who is in the habit of drinking and keeping late hours. You had only to cross the street once and take one drink during working hours to lose the license you did hold a few years ago. But I am glad, young man, that you have taken a brace for the good. I am also glad to give you your license and hope you will take care of it as much for my sake as for your own. It makes only 4 of that class that have been issued from this office since Jan. 1, so you can see how much it means. Some men are sober and go to church, but are careless; some are sober, clean and upright, but are not gifted with a mind active enough to meet emergencies that come up in a steam plant; some merely lack the experience they should have in order to have charge of a steam plant and try to get to the top at 1 bound; while still others drink and keep late hours. These men come to us for licenses and we try to use them with justice, but we are responsible to the State and therefore have to use judgment concerning the man we allow to operate or have charge of the greatest power in the land today. Thousands depend on the sobriety, skill and caution of the engineer and we have to be careful."

There is the whole secret. The inspectors of Massachusetts are men of honor, keen judgment and long experience in judging character. They have spent years in the service of steam and they cannot be bought or bluffed. When a man is all right they will be only too glad to grant him the license he is capable of living up to, so quit your kicking and search your own heart and find out where you are lacking. Get right and try again.

W. E. Chandler.

THE WATER COLUMN

CONCERNING the article by Receiver, in Sept. 1 issue, page 831, "The Water Column," there are several things I should like to say.

In the first place, ground joints and unions are recommended on the ground that packed joints are not reliable. This according to my experience is not correct; besides, when a ground joint starts a leak, it is not so easily remedied as is a packed joint. I fail to understand wherein the steam gage is necessary to the safe and proper operation of the water column. Since the boiler is equipped with a reliable safety valve, and because the steam gage is close to the water column the attendant would be likely not to give both the attention they require. He would look at both, of course, but only one would get real attention; whereas, if they were separated by 4 to 10 ft. he would comprehend the condition shown by the water column before he could look at the steam gage.

Again referring to Receiver's drawing, Fig. 1, he says: "In a column without the valves H and I, when blowoff valve L is opened, the greater portion of the discharge from pipe J is steam, because its velocity is greater than that of the water coming from the lower connection." I do not understand how the velocity of the steam gets such an important place in this problem. It is more believable that the steam would, if anything, tend to pull water through the water connection.

Receiver says: "One of the best signs that both column and glass connections are clear is the gradual rise and fall of water in the gage glass. This sign is not dependable, however, and in no case should it be relied on, as the apparent rise and fall of the water may be the reflection of something moving in the sunlight, or it may be a shadow. Try the gage cocks; that is the only way to learn about the amount of water in the boiler, and its action.

Again, he recommends fixing valve on the pipe connection to the water column while pressure is on them. This, according to my experience, is not a wise thing to do. It is hard to tell what may develop. Fix the valves when the pressure is off, or very low.

Thos. C. Robinson.

AIR IN BOILERS

I NOTICE in a recent issue of Practical Engineer the statement by C. P. Holleran, that just after starting to use steam from a boiler on which steam had just been raised, that opening the throttle causes its pressure to fall faster in proportion than would be the case if the boiler had had steam up for some time. He laid this to a cold boiler setting, then he says that he has come to believe that it is not the case.

I believe the trouble is from the cold boiler setting, as any engineer or good fireman of a 6-day plant will tell you that the most trouble with steam is on Monday morning. After 12 yr. experience with water-tube and fire-tube boilers, where I have always made a practice of letting the air out of a boiler when raising steam, I still have had that same old trouble to steam up on Monday morning. I have in mind one plant of 2 250-hp. Babcock & Wilcox boilers, where the fireman could hardly hold the pressure before about 10 o'clock, so that it was usual to start the fires about 4:30 in the morning. Finally we started up about 1 or 2 in the morning, and thus made it a little easier.

If the trouble was as Mr. Holleran thinks, with air in the boiler, it would take but a few revolutions of the engine to work this air off, and that would not bother a bit. As to propping open the safety valves, I wonder if our engineer brothers have ever tried propping open a spring loaded pop valve. If not, they would get some experience in trying to do it. In our case, Ohio, and Indiana as well, the old lever safety valve is nearly a forgotten antiquity, and anyway I think it is a bad idea to monkey with any safety valve, except when it is necessary to set in. There are 2 good rules in regard to the safety valve, one is to raise it off its seat every day, and the best way to do that is with the shovel by raising the steam pressure; the second is, to let the safety valve alone and not monkey with it. If the battery of boilers is large, and all valves are not set at the same exact point, it might be a good plan to go along and touch each valve, to see that it is not stuck shut.

H. Skaton.

NARRAGANSETT ELECTRIC LIGHTING CO. is erecting a transformer substation on Second St., East Providence, R. I. The station is similar to those already erected in Elmwood and Olneyville. The current will be sent at a high voltage from the Manchester St. station direct to the substation, and, after a reduction, will be ready for distribution through the East Providence district. The new station will cost about $10,000, and, it is anticipated, will greatly improve the service.

Successful Kinks From The Plant

For Saving Time, Work and Trouble

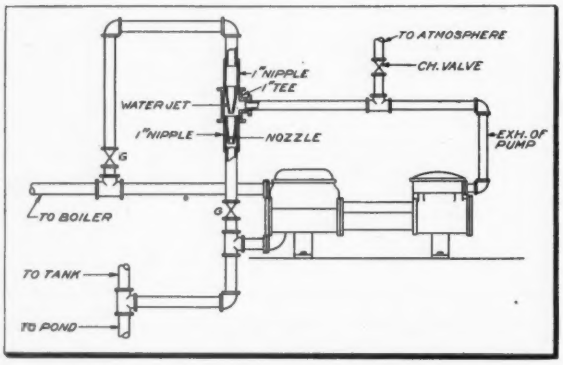
Water Heating Kink

IN June 15 issue Mr. Brooks showed a heater that should be pretty good, but if he had my night man he would have to keep his pipe gang on the job all the time. I am sending a sketch of my heater that cost me about $1, and I raise the temperature from an average of 85 to 160 and 170 deg.

When pumping from tank I have from atmospheric pressure to 1 in. of vacuum in my exhaust, when pumping out of pond I have from 3 to 5 in. vacuum.

The check valve has a spring on it and a screw to regulate the tension. When the pump is running empty there is 2 lb. back pressure in the exhaust pipe. My pump is 4 by 2¼ by 4 and I feed a boiler 72 in. by 18 ft.

O. B. C.



PIPING OF BOILER FEED PUMP FOR HEATING WATER

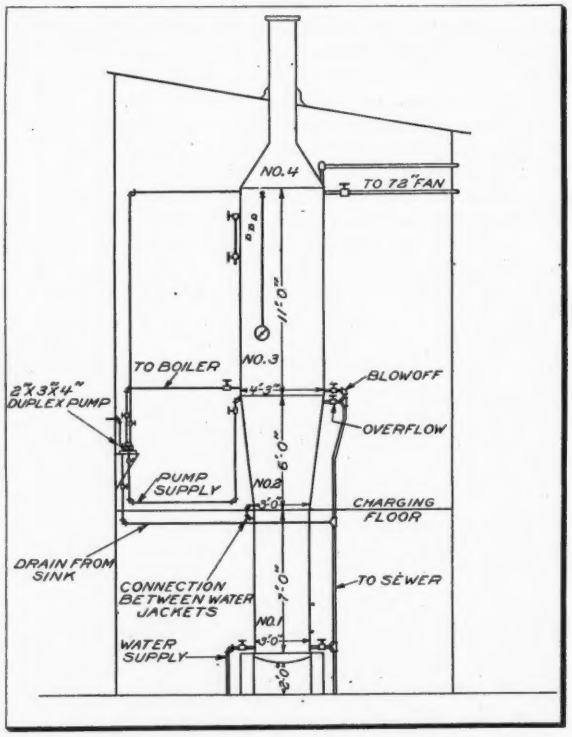
(The water heating scheme given above is rather novel, but the efficiency of its operation would seem doubtful. It will be noted there is a bypass from the discharge to the suction of the pump through a home-made exhaust steam injector and to keep the valves G G at the proper opening would require considerable skill. An oil separator has been left out of the exhaust steam line which may cause oil to get into the boiler. Editors.)

Generating Steam with Waste Cupola Gases

IN connection with our plant we operate a foundry for making iron beds, the cupola of which is run 10 hr. a day. Before the plant was changed to electricity there used to be a 35-hp. vertical boiler in use, to generate steam for a small engine which ran the machine shop. After the change this boiler stood idle. We took the measurements of the boiler and cupola and had an extension piece built (No. 2 in the sketch), to put on top of the cupola, and mounted the boiler on that, so that the escaping gases which were lost now generate steam in the boiler.

The steam is carried 175 ft. to a Sturtevant 72-in. fan and heats the coils, the hot air being used to heat bed enameling kilns, which require 160 deg. F. to be maintained for 3 hr. When the heat is not required for baking enamel it is used for shop heating or in the summer time is turned to use in the feather renovating department.

The cupola (marked No. 1 in sketch), is water jacketed and brick lined as is No. 2. Cupola, connecting offset and boiler are each separate units, being independent of each other except for bypass for water circulation between cupola jacket, and extension. Live



VERTICAL BOILER MOUNTED ON CUPOLA

steam from the boiler house was used in the fan coils before this installation. All piping and boiler are asbestos covered. It has been in operation 3 yr.

Assistant.

Keeping the Pump Running

I NOTE what F. L. Johnson says on page 699, of July 15 issue, about making a duplex pump work when disabled in the water end of 1 cylinder. The writer has had 2 such instances within 3 weeks on duplex pumps attached to barometric condensers; the follower bolts broke, follower came off and 1 segment was caught between the plunger and head, bending the rod close to the plunger. Taking the plunger out, we ran single-acting for a week, carrying 24 in. of vacuum, until we replaced the rod.

In the other case the rod broke off close to the plunger, taking the plunger out. We ran this pump single-acting from 1 until 5:30 o'clock, at which time we put in a new rod, two having been ordered when we had the first break. I have worked feed pumps the same way in marine power plants but the good side works on a short stroke. L. J. Olliver.

Shrinking Band on Cracked Crank Disk

PROBABLY the 2 most common repairs are patching a crack with a flat plate and shrinking (or driving) a band or collar on a hub or disk. The manner of patching a crack or break with a flat plate has no hard or fast rules, but must be left to the engineer doing the job. The following will explain how a band was shrunk on a crank disk.

Having no calipers large enough with me at the time, but having a steel tape, I passed it around the disk, which gave me the circumference, and by dividing this measurement by 3.1416 got the diameter, which was necessary because the band was to be bored out in a lathe. The band was made of steel 1 in. thick and lap welded so as to finish when bored to about $^{15}/_{16}$ in. I had the band bored out $^{3}/_{32}$ in. smaller than the diameter of the disk and faced off the same width as the disk. Near the engine I had a wood fire built and placing a piece of old pipe through the band, laid it on the fire, leaving the pipe projecting several feet on each side of the fire; while the band was heating I got a stick and sawed it a couple of inches

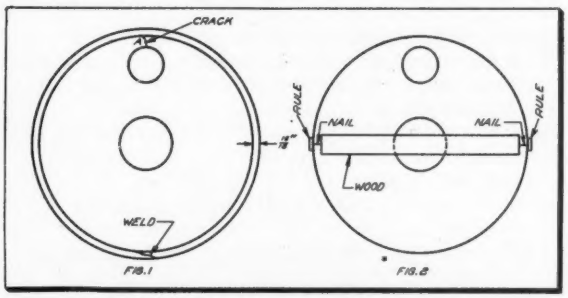


FIG. 1. CRANK DISK SHOWING CRACK AND BAND USED IN REPAIR FIG. 2. METHOD OF MAKING GAGE

shorter than the diameter of the disk; into each end of this stick I drove a finishing nail till it stuck out a little over an inch, by having a couple of men hold rules at opposite sides of the disk, Fig. 2. I drove the nails in till I had the diameter of the disk.

At the time the gage was finished the band was red-hot; by getting a man to lift each end of the pipe the band was lifted out of the fire and the gage tried; the gage appeared to be a full eighth of an inch smaller than the band, which I thought sufficient, considering that it might cool some in taking it to the engine and placing on the disk.

Having blacksmith tongs and sledges at the engine we carried the band in and slipped it on the disk with the weld down and opposite the crack and with a straight edge made the band come even with the sides of the disk. With a hose we started to fill the engine bed with water to cool the welded half first in order to let it grip the disk and thereby prevent the weld from pulling apart.

The section of the band at the crack was cooled last.

Before shrinking the band on the disk the crack was about 1/64 in. wide and afterwards it was hard to find even with close inspection.

Questions that occasionally arise in my mind are: Was the elastic limit of the steel band exceeded? Would it have been a better job if 1/32 or 1/16 in. had been allowed instead of 3/32?

C. R. Weihe.

Repairing a Recorder

ACCOMPANYING sketch shows a hoist counter which is attached to our engine. It is worked by an eccentric attached to a rod back of the indicator dial. The indicator hand is in line with the eccentric center and the eccentric stop is attached to a lever. Adjustment of the throw of the recorder can be made by shifting the point of attachment between the eccentric rod and the lever.

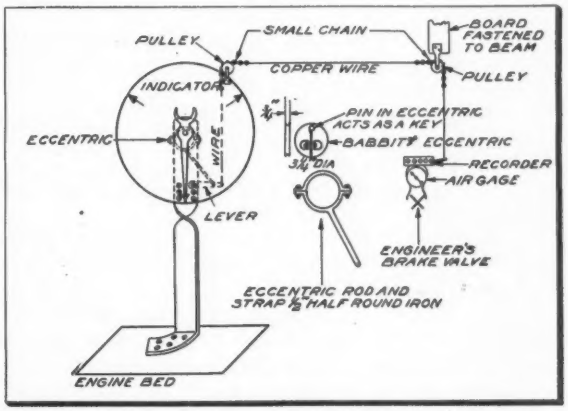


FIG. 1. DIAGRAM AND DETAILS OF A TRIP RECORDER

If desired the recorder can be placed at the bottom of the dial but we have it in front of us and it makes it easy to see just how many loads we hoist. The eccentric gives a steady motion and every trip is recorded.

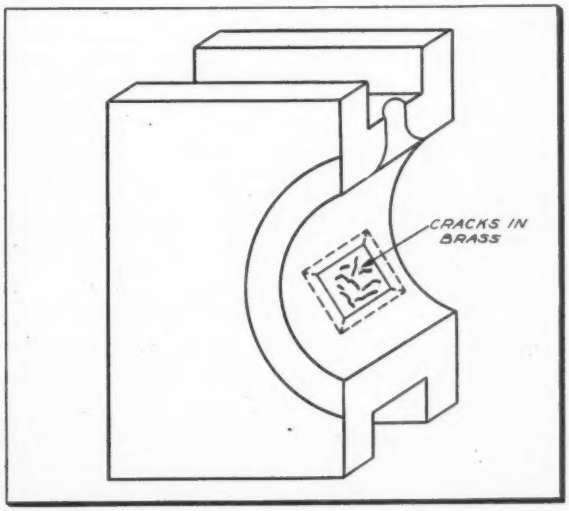


FIG. 2. DEFECTIVE BRASS SHOWING BABBIT PATCH

Trouble was encountered with the crankpin warming up and by examining the brasses I found cracks as shown in Fig. 2, this part of the brass was drilled out and a thimble full of molding dirt was removed. Babbit metal was poured in and scraped and we have had no further trouble. Earl Watkins.

Questions Answered and For Answer

Expert Help When In Trouble. If You Want Quick Answer Enclose a Stamp

Questions on Operation

WHAT are the causes of pounding in a steam engine, and what remedies should be used to stop it?

2. How should an engineer proceed to place a triple-expansion engine in motion?

3. If the safety valve failed to blow off steam when the proper pressure is reached, how may the situation be remedied?

4. What is the practical suction lift of pumping engines; about how many feet?

5. What is the pressure per square inch at the bottom of a 12-in. pipe 135 ft. high, and filled with water at a temperature of 60 deg. F.?

6. How much power would be required to pump 12,000,000 gal. of water 125 ft. high in 24 hr.?

H. B.

A. The causes of pounding are almost numberless, but the most common are, too much lost motion in the working parts and too much lead of the steam valves.

The working parts, such as crank and crosshead pins, should be properly keyed, the main bearing, crosshead shoes and valve gear carefully adjusted.

Sometimes engines pound because some parts are out of line, because of too much play of the piston rings and in several instances because the rings overtraveled the edge of the counterbore, and in others because the piston has worn shoulders in the cylinder against which the piston strikes at the end of the stroke.

2. About 20 min. before the engine is to be put into service, start the air pump, slightly open the bypass valves to the first and second receivers and just start the throttle valve off its seat. This will allow a little steam to pass through all of the valve chests and cylinders. None of the valves should be opened enough to start the engine.

While the cylinders are being warmed, go around the oil feeds and lubricators, see that they are all in good working order and start the feeds slowly.

When the cylinders are thoroughly warmed, and about 5 min. before the engine will be required, hook up the high-pressure cylinder valve gear, open the throttle enough to start the engine and allow it to run slowly.

Go around the oil feeds and lubricators and adjust them for regular service. Let the engine come slowly up to speed, and do not open the throttle wide until the load begins to come on. As the load increases the throttle may be opened wide.

With a releasing gear the hammering of the valve gear at exceedingly short cutoff is annoying and really wears the parts more than the work for which they were intended.

With marine engines when starting, it is a good plan to operate them slowly in full gear both forward and back, for short intervals, to see that everything is in first class working order.

3. Check the fire until the pressure is below the blowing point and lift the valve from its seat for an instant, then raise the pressure to the blowing point again. This should be tried 2 or 3 times, and if it does not cure the trouble, both the safety valve and the steam gage should be tested and set right.

Safety valves often stick to their seats because not operated often enough. At least once on every watch the valves should be lifted to show that they are in working order.

4. About 75 per cent of the theoretical. At the sea level the theoretically possible lift of a perfect pump is 34 ft., but at this height there would be no flow. The water would simply rise to that point. At 25 ft. the limit of practical pumping is reached.

5. At 60 deg. a cubic foot of water weighs 62.37 lb. and a column 1 in. square will exert a pressure of

$$\frac{62.37}{144} = 0.432 \text{ lb. for each foot of height.}$$

Hence, $135 \times 0.432 = 58.32$ lb. per sq. in.

The water weighs $8.3 \times 12{,}000{,}000 = 99{,}600{,}000$ lb.

To raise it 125 ft. will require $125 \times 99{,}600{,}000 = 12{,}450{,}000{,}000$ ft. lb. of work.

In 24 hr. there are 1440 min. This work, if done in 24 hr., would be at the rate of

$$\frac{12{,}450{,}000{,}000}{1440} = 8{,}645{,}833 \text{ ft. lb. per minute.}$$

One horsepower is equivalent to 33,000 ft. lb. per minute, hence, $\frac{8{,}645{,}833}{33{,}000} = 261.9$ hp., to which add 20 per cent for friction of engine and water.

F. L. Johnson.

Governor Questions

DOES the flywheel governor alter the lead or the cutoff?

2. Are flywheel and shaft governor the same thing?

3. Give different reasons for giving an upright engine more lead on bottom than on top.

4. Will lost motion affect one or both ends on a horizontal engine?

5. What are the different advantages of a piston pump and a plunger pump? F. T. S.

A. As a whole, the shaft governor alters both the lead and the point of cutoff with changes in steam pressure and load, although there are a few engines on the market which have a constant lead at all positions of the shaft governor, or practically so; but even so, this shaft governor must alter the cutoff, otherwise there would be no governing.

Nearly all shaft governors are designed so that eccentric swings across the shaft on an arm or pivot. When the governor is in the position of greatest valve travel, as in starting up, lead is comparatively late;

but as the governor swings the eccentric across the shaft, in coming up to speed at light load (or friction load) the lead is increased over what it was set at full valve travel.

2. As the terms are used, a flywheel governor and a shaft governor are the same thing, although, perhaps, there ought to be some distinction, as in this type of engine, the governor is not always in the flywheel. For instance, the Buckeye engine has a separate light wheel in which the governor is located, and it is seldom or never placed in the flywheel unless lack of space prevents the installation of an engine with the additional room that this governor wheel demands.

3. Under ordinary operating conditions, as usually met in everyday practice, it is not possible to counterbalance the cranks of a vertical engine so as to equal the weight of the reciprocating parts and additional lead must be provided to bring these parts to rest at the end of the stroke without shock or jar. This is especially so in marine passenger service, as the vibration of the engine is felt throughout the ship.

4. It all depends on where the lost motion is. Lost motion in the pins, bearings, eccentrics, links, etc., or in the eccentric and hook rods back to, and including the wristplate, is in a position to affect both ends of the engine; that is, the defects will be the same on the out stroke as the return stroke.

Naturally, however, any lost motion in any of the connections between the wristplate and any of the 4 valve of a Corliss or other 4-valve engines, will be common to that particular part, and will not affect the other end.

5. A piston pump is simpler and cheaper for any given capacity, and for comparatively clean cold water will operate at low and medium pressures satisfactorily. It has the disadvantage that in order to examine the water piston the backhead must be removed, and at best it is not an easy matter to pack the piston so that it is "just right," for if too tight, there is excessive friction, and if too loose, there is too much slip.

A plunger pump is usually preferred for a boiler feed, especially in the larger sizes, because it will handle water as hot as is usually found in boiler feeding. Being outside packed, the condition of the packing and leakage can be inspected at any time, and in case of renewal of the packing it is a comparatively easy job. A plunger pump will handle gritty water much better than a piston pump, and seems to handle water, hot or cold, with less shock and vibration than does a piston pump. G. H. Wallace.

Effect of Steam Pressure on Engine

WE have several engines about the plant of varying makes, styles, and sizes. They are all operating under a maximum steam pressure of 105 lb. Let us suppose that the load is constant and not increased—would it then be any greater strain upon the engines to increase the steam pressure to 125 lb. or even to 150 lb.? In other words, does it make any real difference to the engine how much steam is carried up to 150 lb. as long as no greater load is put upon the engine?

If the pressure is increased upon the engines and subsequently they are changed to the condensing type, would it still make any difference if the load was not increased?

The point the writer is getting at is this, by way of illustration: if a 30-ton locomotive can pull a 20-car train with a ¾-in. old-fashioned link coupling, cannot a 150-ton locomotive pull the same load with the same coupling? Does this illustration apply and why not, if not? We are comparing the coupling in this case to our engines and see no reason why, if we do not increase the load, they cannot stand the higher pressure. T. H.

A. The engine is subjected to higher strains just in proportion to the initial steam pressure placed upon it—regardless of the load which it may be carrying.

For instance, when steam at 105 lb. pressure is admitted into the cylinder, it exerts a pressure of 105 lb. to the inch, which must be carried by the piston, piston rod, crank, and frame-work of the engine until cutoff occurs, after which time the pressure in the cylinder gradually decreases until exhaust takes place.

Now, if steam at 150 lb. is admitted into the engine cylinder, the pressure upon the cylinder is, of course, 150 lb. per square inch. This multiplied by the area of the piston will give the total strain upon the piston, piston rod, crank, etc., up to the time of cutoff, and the strain upon the engine is, therefore, almost 1½ times as great as in the former case.

The engine, of course, may stand up under the pressure of 150 lb., if it is built for 105 lb., but by so doing, you are reducing the factor of safety of the material used in the construction of the engine and running a great deal of risk.

In regard to running an engine condensing, you would have a similar increase in strain upon the material in the engine, owing to the fact that with a noncondensing engine, you have a difference of pressure between the pressure side of the piston and the exhaust side of the piston 15 lb. per square inch less than you would have with the condensing engine. For this reason, then, the strain upon the piston rod in pounds would be greater by 15 times the area of the piston than with a noncondensing engine.

Your illustration of the pull upon a coupling link is not a parallel case, inasmuch as the pull upon the link is a constant quantity, while the pressure upon the piston varies from that of the boiler down to atmospheric or vacuum pressure. An engine must be designed to take care of the greatest pressure which will be put upon the cylinder, and this, of course, is the admission or boiler pressure. R. E. T.

Elevator Switch Trouble

IN an Otis freight elevator we have had trouble with the switch lever working out of its center position and I suspect that it is because the lock which holds the lever is too far away from the arc in which it should turn. There is an opening of ⅜ in. and I think this should be cut down to about 1/32 in.

G. P. A.

A. Consulting with the Otis Elevator Co. they state that there is not sufficient data in the description as sent to enable them to tell just what is the cause of the trouble, but they feel that in all probability either some part has been broken off, or something is so worn that the lever does not act as it was originally designed to. The distance referred to should be very small, in fact, only just enough to clear the lever so that the lock will hold firm.

THE SECRETARY OF STATE recently licensed the Standard Power Equipment Co., Chicago; capital stock, $22,000; to deal in, handle and install power equipments of various kinds: James M. Stannard, George W. Clucas, Howard A. Baker.

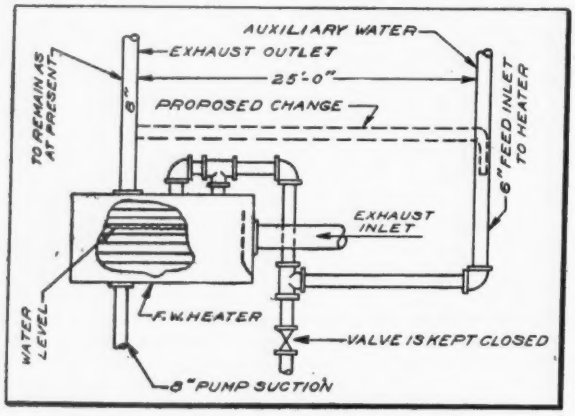
Problems For Discussion By Readers

What Would You Do If You Had These Conditions To Meet?

Heater Problem

IN this plant, which is run condensing, we heat our feed water with the exhaust from the pumps. We have here also several 6600-volt transformers that are water cooled. This water formerly ran to waste; but recently, following a suggestion of mine, it was piped so that we could use it in our feed water heater. As all the feed water is metered and paid for, there is a large saving in water bills.

Our feed water at this time of year, reaches a temperature of only about 185 deg., and owing to the construction of the heater all the steam is not condensed but passes directly to the atmosphere. In order that we may get full benefit from the steam that escapes, I suggested that we pipe the free exhaust as shown by the dotted lines in the sketch. I contend that the steam will be drawn to the auxiliary water pipe by induction and give up all its wasted heat there.



PROPOSED CHANGE IN HEATER CONNECTIONS

Perhaps it would be well to put a back pressure valve where the sketch is marked exhaust outlet, but I don't think it is absolutely necessary.

There is another inlet on this heater (not shown) where the additional water required is admitted by an automatic valve.

I should like to know the ideas of Practical Engineer readers on this suggestion. By looking at the sketch it will be seen why all the exhaust is not condensed. The baffle just inside the heater in front of the exhaust inlet forms the oil separator and at the same time deflects the steam to the top of the heater, so that it has a direct path to the exhaust outlet.

H. Skaton.

Heat Value of Fuels

IN regard to E. K.'s question concerning sawdust for fuel instead of coal, I had the opportunity to make a test some years ago. We bought maple shavings for one dollar a ton and used a coal at the same price he is paying now. Our evaporation per pound of coal was 8½ lb. of water. The best we could do with sawdust was 3 lb. of water per pound of sawdust. The cost to evaporate 1000 lb. of water was about 15.3 cents for coal, while the sawdust was costing 16.6 cents to evaporate 1000 lb. of water. I should advise E. K. to run a boiler test with coal and one with sawdust as fuel. That will tell him the cost to evaporate 1000 lb. of water. Jac. Brower.

In regard to the inquiry of E. K., page 857, Sept. 1 issue, it is a little difficult to estimate the value of screenings, as there is always a percentage of dirt mixed with these and the amount of this percentage varies a good deal with the handling of the screenings.

Hocking Valley coal runs about 14,000 B.t.u. per pound, when there is 9 per cent ash. Probably your screenings will run 15 per cent ash, which will cut down the heat value about 6 per cent, or say, roughly, 1000 B.t.u., leaving you a heat value of 13,000 B.t.u. per pound.

The heat value of wood is 5600 B.t.u. per pound, and does not vary greatly, regardless of the kind of wood, but will vary a good deal with the moisture in the wood. The value given is for ordinary conditions. If your shavings are from a kiln-dried lumber, the heat value will probably run higher—say, up to 7200 B.t.u. per pound.

Assuming 13,000 B.t.u. per pound of coal, and at a price of $2.60, you are getting 100,000 B.t.u. for a cent. At $1.00 per ton, your wood must furnish 5000 B.t.u. per pound to be equal in value to the screenings. Of course, if your screenings have a low percentage of ash, the wood must produce just that much higher value in heat units in order to be worth buying.

It would seem, however, to be, at the prices you state, about an even thing as between the 2 fuels, with the probabilities in favor of the wood and shavings. A. L. R.

Time Required to Empty Tank

TIME to empty the tank described by M. I. T., Aug. 15 issue, page 807, is calculated in the following manner.

Tank dimensions: height, 10 ft.; diameter, 8 ft.; pipe sizes: 2 in., 1½ in., 1¼ in.. and 1 in.

Assuming the tank to be cylindrical, the cross-sectional area=$4\times4\times3.1416=50.3$ sq. ft.

Cross-sectional area of the pipes=

$$\frac{[(2\times2)+(1.5\times1.5)+(1.25\times1.25)+(1.0\times1.0)]\times0.7854}{144}$$

=0.0481 sq. ft.

The exact time required can only be calculated when the friction constants of the tank and orifices are known; but a close appropriation can be made by

neglecting the friction. By using the calculus, we obtain a formula for the time required to empty a vessel:

Time in seconds:

2×area in sq. ft. of tank cross section×the square root of height in ft. of water÷area in sq. ft. of pipe cross section×$\sqrt{2\times32.2}$

For the above tank:

$$\text{Time}=\frac{2\times50.3\sqrt{10}}{0.0481\sqrt{64.4}}=823 \text{ sec.}$$

=13 min. 43 sec.

Haylett O'Neill.

The Indiana Boiler Inspection Law

IN the August 15 issue of Practical Engineer, J. O. B. criticizes the new Indiana law concerning boiler pipe work. I believe that he is right in his contention that the change would be dangerous.

This law, of which the writer has a copy, says that a valve shall be placed not more than 18 in. from the boiler on all steam outlets. Of all the mistakes of law makers dealing with problems relating to mechanical engineering this is the worst. If all boilers in Indiana were equipped at one stroke of the clock it would be a safe prediction that inside of 48 hr. there would be a number of accidents due to water hammer, causing loss of life and property. To place a valve in pipe work as required by this law would, in at least 90 per cent of all instances, make a water pocket that would be dangerous.

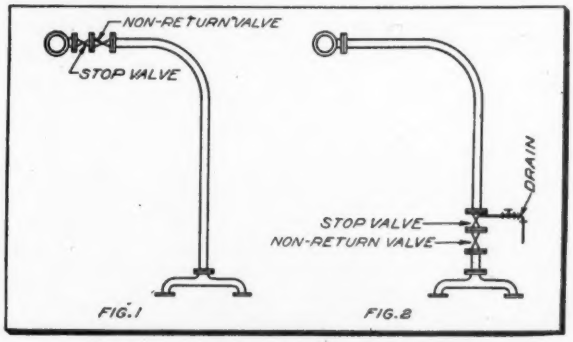


FIG. 1. PRESENT BOILER CONNECTIONS
FIG. 2. BOILER CONNECTION REQUIRED BY INDIANA LAW

Of course, a drain pipe might be put on by which the water could be blown out, but this brings into operation the human element; someone will forget to open the drain, then the next thing we have to do is to write up an account of a terrible accident or possibly a boiler explosion. We should not design anything as dangerous as a steam pipe, so that by any possibility men may make a mistake and meet with accident, for to be safe we must eliminate as far as possible the human element in the operation of dangerous devices.

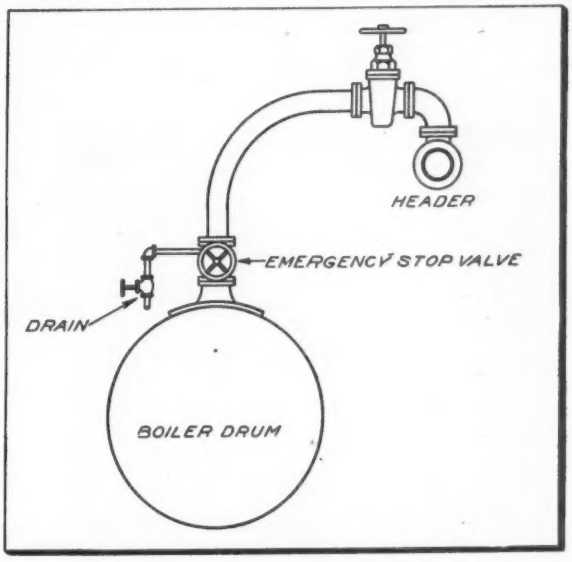
The writer has just erected a new steam main with boiler connections as shown in Fig. 1, and if we had to meet the conditions of the Indiana law we should be compelled to install something like that shown in Fig. 2, which would be a dangerous connection and likely to result disastrously. In an operating experience of over 30 yr. the writer has never known of an accident to pipe work that a valve so placed would have prevented.

This part of the law should be repealed, for it will not only work an unnecessary hardship on plant owners but will further add to the dangers of plant operation, of which there are plenty now. This is an important question, and should be freely discussed by engineers everywhere so that no mistakes be made along this line of new safety laws.

Frederick L. Ray.

Position of Valve on Steam Outlet

IN answer to J. O. B., Aug. 15 issue, the reason for the law preventing having a valve on the steam outlet not more than 18 in. from the boiler is hard to see. Where a header is located above the steam outlet, however, the method of tying into the header shown in the accompanying sketch may be safely used under



ARRANGEMENT TO DRAIN BOILER LEAD

ordinary circumstances. As a rule, before starting to put the boiler on the line, the drip should be opened to let out any accumulated moisture; but this is not necessary if the emergency valve is opened first. In that case the moisture of condensation will flow back to the boiler and the danger of priming the header will be nil.

Haylett O'Neill.

Valve Rattle

I NOTICE in your Sept. 1 issue, page 957, that F. W. O. is annoyed by his engine valve rattling when his engine is drifting. He says it is due to the partial vacuum created by the moving pistons which to my notion is not the cause. The rattle is caused by compression, kicking the valve off the seat, and the springs bring it back to the seat again, which causes the noise.

The rattle can be cured by chipping the inside lap off the valve; but it is a job that requires some skill, in fact valve design must be understood to do the job right. If F. W. O. will make a study of the Zuener Diagram unless he already understands it, I think he will be able to do the job without any trouble.

Geo. W. Shilling.

JOHN T. WINDRIM is preparing preliminary plans for a large power station to be erected for the Philadelphia Electric Co. at Beach and Palmer St., Philadelphia.

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CONTENTS

Iroquois Iron Co. Plant. Illustrated..... 929
What Germany Can Teach America. By Sterling H. Bunnell. Illustrated..... 935
Safety Valve Pointers. By Receiver. Illustrated..... 936
Sparking and Commutation. By William C. Thorne. Illustrated 938
Overhauling a Series Motor. By C. R. Weihe. Illustrated.. 940
Large Precision Testing Machine. Illustrated..... 941
Elevators, Care and Operation..... 942
Foreign Development in the Power Plant Field. By J. H. Blakey. Illustrated..... 943
Novelty in Plate Ice Freezing. By William S. Luckenbach. Illustrated 944
Letters Direct from the Plant: Indicating Pumps. Engineer's License in Massachusetts. The Water Column. Air in Boilers. Illustrated..... 945
Successful Kinks from the Plant: Generating Steam with Waste Cupola Gases. Water Heating Kink. Keeping the Pump Running. Shrinking Band on Cracked Crank Disk. Repairing a Recorder. Illustrated..... 948
Questions Answered and for Answer: Questions on Operation. Governor Questions. Effect of Steam Pressure on Engine. Elevator Switch Trouble..... 950
Problems for Discussion by Readers: Heater Problem. Heat Value of Fuels. Time Required to Empty Tank. The Indiana Boiler Inspection Law. Position of Valve on Steam Outlet. Valve Rattle. Illustrated.....952
Editorial: Be Prepared..... 954
Guests of Springfield. Illustrated..... 955
A Visit to the Exhibit. Illustrated..... 963
News Notes 972
Novel Coal and Ash Handling. Illustrated..... 973
Forged Steel Fittings 975
Motor-Driven Geared Head Lathe. Illustrated..... 975
Automatic Regulation of Superheat 976
Books and Catalogs..... 977
Trade Notes 978

BE PREPARED

Summer vacations are over, and in a few weeks the temperature will have dropped low enough to make the heat of the fires feel good, and the calls will begin to come into the engine room for heat in this or that part of the building. There will be little or no warning, but a sudden drop in temperature overnight may change summer into winter in a day.

Is your heating plant ready for service? Did you get those pipes repaired that gave so much trouble last season? Have the pumps, traps, fans, valves, and other apparatus connected with the system been overhauled, repaired, and repacked? How about the radiators in that department that made so much complaint last winter, did you change the system or find and remove the cause of trouble? Did you make that change in the piping system that you figured would reduce the coal consumption?

In short, are you prepared to meet a sudden call for heat? A great many engineers are ready; in fact, they got the heating plant ready as soon as the heat was off last spring. That was the proper way, and, by so doing they will have little cause for worry this fall when the steam is turned on. But there are also many engineers that are not prepared. The repairs have not been made, possibly it was the fault of those higher up; but the time is getting short indeed, and something must be done about it at once to prevent a possible loss of much money through employes trying to get the work out with cold fingers. How many of you that have waited until the last minute can remember all the changes that you promised yourself to make last spring, even if there were time to do so now? What sort of a record or report have you been using whereby the action of every part of the system can be studied? This not only applies to the heating system but to many other departments as well.

In many lines of business this is a dull season of the year, and some of the machinery may be shut down. This dull season should be the engineer's busy season in getting prepared for the rush later on. Repairs should be made, engines overhauled, boiler settings repaired, valves packed, and the contemplated changes in piping or shafting which you have no doubt been figuring on for some time, or there may be other changes in some part of the plant which would save a large sum of money in course of a year. These changes can best be made while the work is slack. If you have not already done so you should lose no time in taking the matter up with the company for your own benefit as well as the company's. It is your duty to the company to do all that you can to reduce the expense in your department. That is what you are hired for. And it is your duty to yourself to prove to the company that you are alive to the situation, and that you know how to do these things. This applies to every part of the power plant.

GUESTS OF SPRINGFIELD

Where Hills and River Meet in Ye Olde Bay State

ON A BRIGHT September morning, we knocked at the door of the City in a Forest, and quickly it sprang wide open to show the smiling face of Walter H. Damon, Chairman of the Local Committee waiting to give welcome. We shook hands and asked anxiously, "Is there anybody here?" and Damon the effective and always ready replied, "You're late; your 2 presidents, Skinner and McGrath, have been here so long that they're wanting to borrow money, and they're wondering where 'twas your train ran off the track."

Evidently all hands and several besides had been there some time for everything was coming along in fine shape, and the few delegates who were on hand Monday morning saw a miraculous transformation from a jumble of boxes and a bunch of perspiring men to an orderly exhibit at noon, presided over by courteous salesmen, ready to joke or explain as might be desired, and a registration system working to perfection so that delegates, exhibitors and ladies were numbered, tagged and decorated with the handsome badges almost as rapidly as they could pass by the desks, and by night every exhibit was in full swing, all were duly registered and all were happy—at any rate after dinner. The western crowd which rode all day without anything to eat because the train was too late to stop for meals, and there was no diner, weren't happy until they were fed.

FIG. 1. CHAIRMAN WALTER A. DAMON OF THE LOCAL COMMITTEE

And it was some exhibit. Two floors of the big Auditorium filled with matters of interest and importance to engineers; 200 booths tastefully decorated in green and white with gilded signs, arches of flowers and branches among which gleamed colored lights, a fairyland forest which needed only the birds to complete the illusion—and along comes Payne of Dearborn with his little singers and makes birds of the whole crowd.

Well, more of the exhibit later, but it was opened formally and impressively in the evening with short addresses by W. H. Damon, aforesaid chief welcomer, J. R. Coe, national vice-president and President John McGrath, of the N. A. S. E., the real boss of the whole week, while President M. B. Skinner of the N. E. A. held the watch on each of the other bosses and told them when to "get set" and "go." It was a big first day a big opening of a big exhibit and a big week. Springfield did her best, and a mighty good one; well may she be proud of it; and well may those who planned and executed for the comfort, convenience and profit of others rest satisfied in the gratitude of those whose week on the banks of the Connecticut left so many pleasant memories.

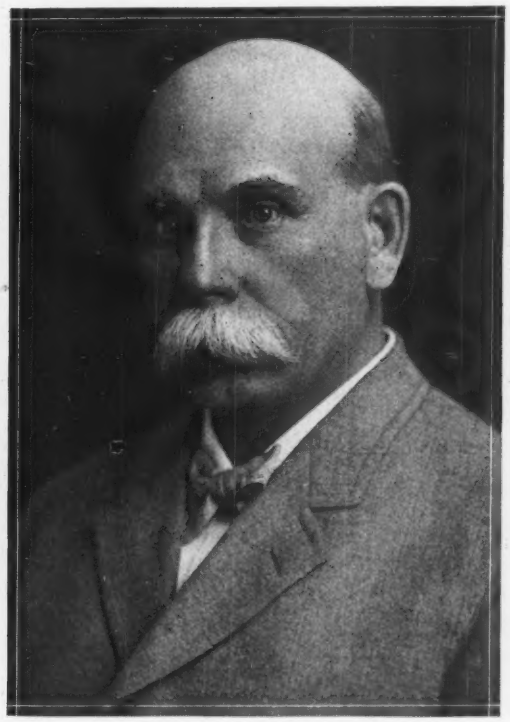


FIG. 2. PRESIDENT J. F. McGRATH OF THE N. A. S. E.

Exhibitors' Meeting

MONDAY at 5 they met. At 5:30 they adjourned. That was quick work, but they're a rapid aggregation. In that time they heard reports, appointed a committee to revise the constitution consisting of H. E. Stone, W. E. Johnson, A. C. Ashton, C. D. Allen and F. L. Morrison, a nominating committee, J. A. Carson, H. E. Stone, A. C. Ashton, A. L. Rice and

F. R. Low and voted to keep the exhibition open until 10 p. m. Saturday evening. There's nothing like knowing what you want and then going right after it, to get results.

Warming Up

THE whole operating force were on hand to see the start; and a better setting could not be imagined. In the center a great collection of the best products of America's factories full of interest and instruction for visitors. Around the sides, balconies filled with delegates from Maine to California and from Minnesota to Louisiana, representing the great calling of Practical Engineers, with the ladies to lend color and charm to the scene. At the front, ready to speak the words which should start the organization on the work of its 31st annual convention, and surrounded by the representatives of Springfield, the officers and past officers of the N. A. S. E., was Chief Damon, ready to "start 'er up" by introducing those who were to speak.

Charles H. Bosworth of the Board of Trade, next on the program, endorsed the attitude and effort of the Association in Educational matters and the part that such work plays in the struggle to raise from a physical worker to a brain worker. He spoke of the part of associations in training to co-operation, the duty of the strong to assist the weak, and the effort for welfare of the community as well as that of the individual. Turning to the industrial side, America is committed to the policy of making that which is best and selling at the lowest price consistent with quality, a policy which depends for its success on development of mechanical arts and application of power to industries. In these things, engineers and education play a vastly important part.

Responding, Vice-President J. R. Coe outlined the change in power plant conditions from early days of hard physical endeavor to the present of mental supremacy; the increase of responsibility and the wide knowledge required by present complex systems; the need of co-operation and harmony among engineers and employers to solve the problems arising in plants in order to secure greater efficiency and higher earning power of plants.

GROUP AT SPRINGFIELD, SECTION A

After invocation by Dr. Elliott, Mayor Denison spoke briefly of the real and earnest wish of all in Springfield that the stay of strangers in the city might be pleasant, and the work of the week profitable.

President McGrath, aroused from contemplation of the beautiful hall and gathering by Chairman Damon, mentioned the fame that the city acquired in the making of the old Springfield rifles 50 yr. ago, the reports of which in the hands of white men struck terror to the hearts of western Indians. Now Springfield reverses itself and gets renown by the manufacture of Indians (motorcycles) which by their toots spread terror through the streets of white men. He reviewed the work since 1882 in advancing education, license legislation and acquaintance among engineers and indicated its favorable attitude towards factory inspection, compensation laws and safety measures.

In a long and complete address, Stewart Anderson of the Springfield Publicity Club emphasized the position of engineers at the present time as the exemplars of efficiency and progress, the 2 principles of modern development. Gratification of physical needs and innocent vanity is not life's highest aim. Man cannot be content. He must develop his utmost capabilities and strive for the dignity of manhood and its expression in efficient service.

Past President E. H. Kearney spoke humorously of the duties of his office; to advise the President, to speak last and to "be brief." He expressed the thought that New England welcomed the convention to its

hospitable homes, its historic scenes and its beautiful hills and rejoiced at the chance to assist the Association in gaining for engineers a broader outlook toward meeting the ever increasing demands for knowledge.

Mayor Scanlon, speaking of pleasant recollections of the Massachusetts state convention in Lawrence, expressed the wish that that city might soon be again favored with such a meeting of the state or better yet the national convention.

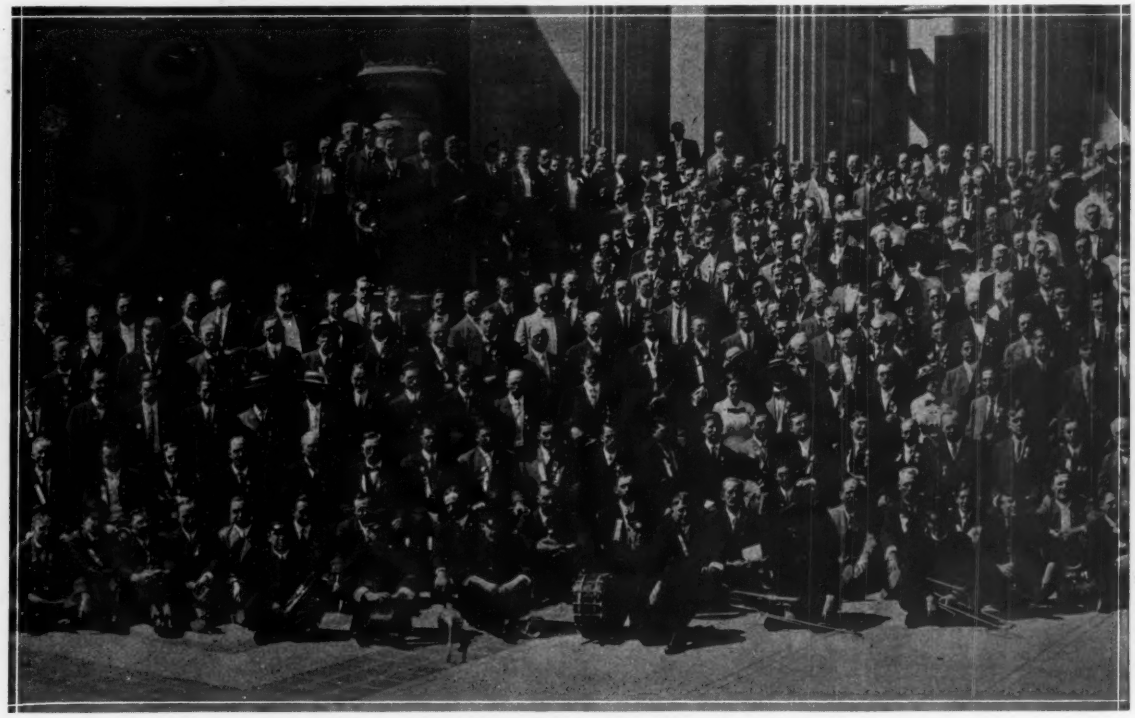
Steam Turned On

CHIEF McGrath then took the throttle and opened her up a little to see that everything would turn smoothly when the current should be turned on in the afternoon, and appointed the various committees which were to act as stokers, oilers, assistants and switchboard tenders in operating the system for the week. The official photograph was the close of activity for the morning, and the plant was shut down for the noon hour. While it was not a 24-hr. run throughout the week, it was continuous day service, and though the main unit might not be running, the auxiliary machinery—campaigning for offices, committe work, efforts to land the 1914 convention—were always in action so that pressure was kept up on the system at least 25 hr. out of the 24. Active condidates for vice-president were F. L. Ray of Louisville, Ky., and W. C. Long of Toledo, O., and nobody knew until the votes were counted which one would win. Detroit, Indianapolis and Milwaukee were contenders for the convention of 1914, each eager for the honor. And so there was no lack of activity at any time.

But McGrath and Damon believe in starting up on time, and so whether in sessions or entertainments, the gong rang and the wheels turned over at the time set on running orders. So delegates got in the habit of being prompt or being left and things ran smoothly forward.

At 2 o'clock President McGrath called to order to read his report containing a summary of the past year and recommended running orders for the week. He told of the hundreds of illustrated lectures given during the year from the Associations slides and notes; of the competitive answers to questions; of the information bureau; and of the desire of officers and committees for constructive criticism and suggestions as to methods of bettering the educational work.

Efforts for license legislation have been put forth wherever local activity was manifest, and he believed this a field of greatest importance, and that $2000 should be authorized for carrying on the work. He spoke of the importance of state associations and recommended that they take over some of the work now done by the national association, and commented on the failure at some state conventions to give to the welfare and educational work the attention that they deserve. He advised that the proposed program for each state meeting be submitted to the national president so that proper uniformity may be secured, and provision insured of a balance of attention to welfare, education, entertainment and exhibits. He recommended that reports be sent direct by local secretaries to the national secretary thus relieving state deputies of much useless clerical work.



GROUP AT SPRINGFIELD, SECTION B

Report of the credentials committee showed 408 delegates in attendance.

From Vice-President Coe came the report that 4 new local associations had been formed, and applications received for 7 more, but not completed.

Reports of the Educational Committee followed and, in brief, outlined the conduct of 2 contests on answering questions; for the first, the 1st prize went to F. L. Ray of Kentucky, the 2nd to W. T. Frizzell of Massachusetts and the 3rd to H. E. Pressinger of Wisconsin. On elementary questions, the 1st prize went to C. E.

McLean the 2nd to J. O. Burman both of Massachusetts and the 3rd to N. S. Campbell of Michigan.

A second contest resulted as follows: Advanced course, 1st to R. B. Ambrose of Pennsylvania, 2nd to H. E. Pressinger, Wisconsin, 3rd to M. O'Connor, Wisconsin. Elementary course, 1st to C. B. Hudson, 2nd to J. Guilfoy, 3rd divided between J. O. Burman and C. E. McLean, all of Massachusetts.

For specially instructive meetings, prizes were awarded to Illinois No. 1 of Chicago and Kentucky No. 1 of Louisville. Seventy-five questions were reported as answered by the information department.

Slides and information have been prepared on Turbines, Boilers, Gas Engines, and have been shipped to and used by various associations throughout the country with great satisfaction. A set on engines is in preparation. Recommendations were that the lecture systems be continued and enlarged, prizes given for best meetings and answers to questions, and effort made to secure wider activity in the answering of prize questions.

GROUP AT SPRINGFIELD, SECTION C

License Laws

AS a result of license law activity, the committee on that work reported that, in Delaware, a law authorizing city ordinances passed the senate, but was defeated in the house. In Michigan a license and boiler inspection law passed the house but was lost in the senate. Bills in Illinois, Oregon, Kansas, Indiana and Minnesota have failed of passage, some being killed in committee and some in vote, but in all cases progress was made and plans laid for future work. New Jersey and California passed laws for examining boards, in New Jersey under the Department of Labor, in California as a separate department. Ohio amended its inspection laws to give greater authority and insure prompt compliance with all provisions. Cities of Geneva, N. Y. and Decatur, Ill., have passed local ordinances.

A special committee on engineering legislation of the Uniform Laws Commission now has under consideration the framing of laws which will permit of interchange of licenses and steam boiler shipments between the states.

At the meeting of the Life and Accident Department on Tuesday afternoon the report of the secretary showed 37 claims allowed for benefits amounting to $18,500, 4 rejected and 8 under consideration. The membership in this department is now 3587. The report was accepted, and the old officers reelected; J. G. Beckerleg, chairman of trustees, T. N. Kelsey, trustee for 5 yr., and J. D. Taylor, secretary-treasurer.

"To the smoker" was the order after the exhibit closed on Tuesday evening, and, headed by the band, the long line marched to Hibernian Hall. The doings there cannot be conveyed in print, but jokes, songs and stunts contributed to the good fellowship, and nobody went home until he so willed.

A Short Session

PRESIDENT McGRATH believes in starting when the whistle blows, so at 9:15 Wednesday morning he started.

Reporting as to conventions every 2 yr. instead of annually, the committee stated that of 340 letters sent out to local associations only 162 were answered, with 116 associations favoring annual meetings against 45 for biennial. The longer period was feared as tending to a lack of interest, but there was found a sentiment in favor of a closer connection between state and national bodies and possibly at some time in the future

state associations supplying the delegates to national meetings. This report was accepted as voicing the sentiment of the Association, at least so far as period of meetings is concerned.

As to a written history of the Association, the material was reported to be on hand, but preparation was not recommended, as there seemed no demand for it and a heavy expense would be incurred.

Ruling on the standing of the New England States Association, President McGrath said that its formation was permitted, but it had no legal standing under the constitution, a ruling which was approved by the convention, and a resolution permitting the formation of district associations was defeated.

Requirement of a bond from a bank acting as depository of N. A. S. E. funds was approved, and a mileage of 5 cents to delegates was voted.

Notable features were the provision of a separate drinking water system with constant flow in summer to insure coolness, and the covering of all motors, belting and gears with wire mesh to protect against injury of workmen. A clear idea of the great amount of product handled was gained from the trip through the storage for finished parts, one story in height, with floor 300 by 130 ft., splendidly lighted. An example of real big work was a 9-ft. gate valve, through the opening of which a touring automobile was easily driven.

Off to the Park

DOWN Main St. sped car after car marked "Special" until 20, filled to the limit, had passed, and the procession sped swiftly on to Riverside. Clams! and Lobsters! bushels of 'em done to a turn and devoured

GROUP AT SPRINGFIELD. SECTION D

Early adjournment was taken to permit of the visit to the works of the Chapman Valve Co. at Indian Orchard.

After the enjoyable trolley ride, the engineers were welcomed by A. W. Gilbert, president of the Company, and Roger Shirley, works manager, who explained the different types of valves made. Then the exploring parties started through the 8 big buildings, with their 250,000 sq. ft. of floor space. First to the machine shop for smaller valves from ¾ to 10 in., then to the room where larger iron valves up to 48 in. and weighing 20,000 lb. were being finished. A notable valve recently turned out here was a 40-in. blowoff of all bronze, operated by a hydraulic cylinder, and weighing 17,000 lb., for use on the New York water system. The big iron foundry was an impressive place with its equipment of latest machinery and electric cranes capable of handling 60 tons a day, and the brass foundry was just as complete and interesting, though, of course, not so large.

to a finish by 1800 industrious diners, is the brief story of the feast that followed, the biggest clam bake in New England history.

And there preceded and followed this great feature of the day's fun, a ball game in which the Exhibitors came off victorious over the Engineers by a score of 9 to 3, and a series of athletic events in which the West had a greater pull than the East in the tug-of-war for a loving cup, and races for fat men, for lean men, for wives of men and for daughters of men, all arousing the greatest enthusiasm, and rewarded by prizes contributed by the National Exhibitors' Association.

In recognition of his courtesy, Adolph W. Gilbert, who was responsible for the clam bake, was presented by Walter Damon, on behalf of the Convention Committee, with a handsome loving cup of heavy silver.

Music, dancing, fireworks and the amusement devices of the park kept all busy and happy until late in the evening.

More License Law

SHARP at 9:15, Thursday, President McGrath started the wheels turning again and the license committee reported a law passed in Pennsylvania which made a license ordinance and inspection law obligatory in all cities of the 3rd class, some 38 in number. Later, in discussing a recommendation that in striving for state license, cities having local ordinances be exempted from such laws, it was laid on the table and not favored, $2000 was voted for assisting in securing license laws.

In considering the reports of officers, the submission of state convention programs to the national president for approval 60 days before the meeting was adopted, but the sending of reports of local secretaries only direct to the national secretary was defeated. Mileage appropriation of $18,293 was made and the suggestion of the trustees of the National Engineer that 25 per cent of the money received from that paper be refunded to local associations was adopted.

Prof. E. F. Miller, of Mass. Inst. of Technology, delivered an address on The Engineer, in which he outlined the difference between the mechanical and operating engineer, their training and experience, and emphasized the importance of having all classes of engineers realize their importance to the community and take their proper place among men.

Continuation of the educational system and the information department was approved, with awarding of prizes to individuals and associations, $3000 being set aside for this work. Lantern slides might be held to cover 2 consecutive meetings.

Report from J. D. Taylor, of New York, showed the evil of discriminatory rates as offered by the electric company in that city, especially where it was desired to supplant isolated plants, but the Public Utility Commission is now taking a position which will probably eventually abolish this evil.

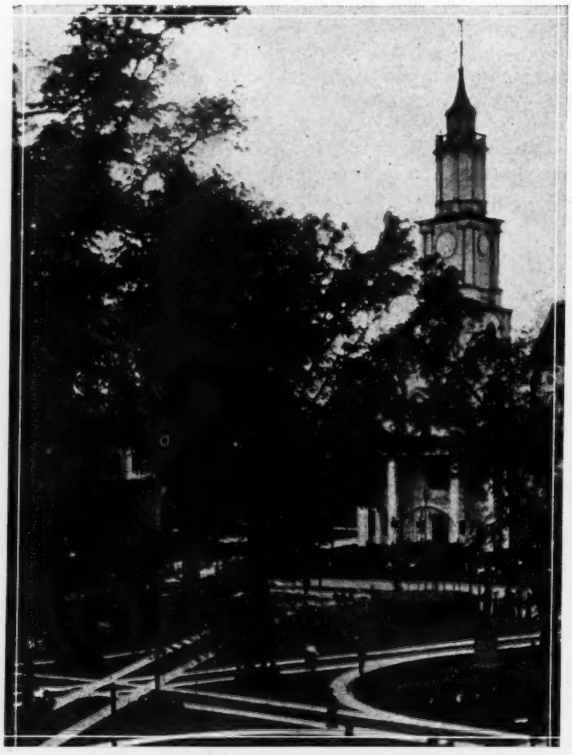
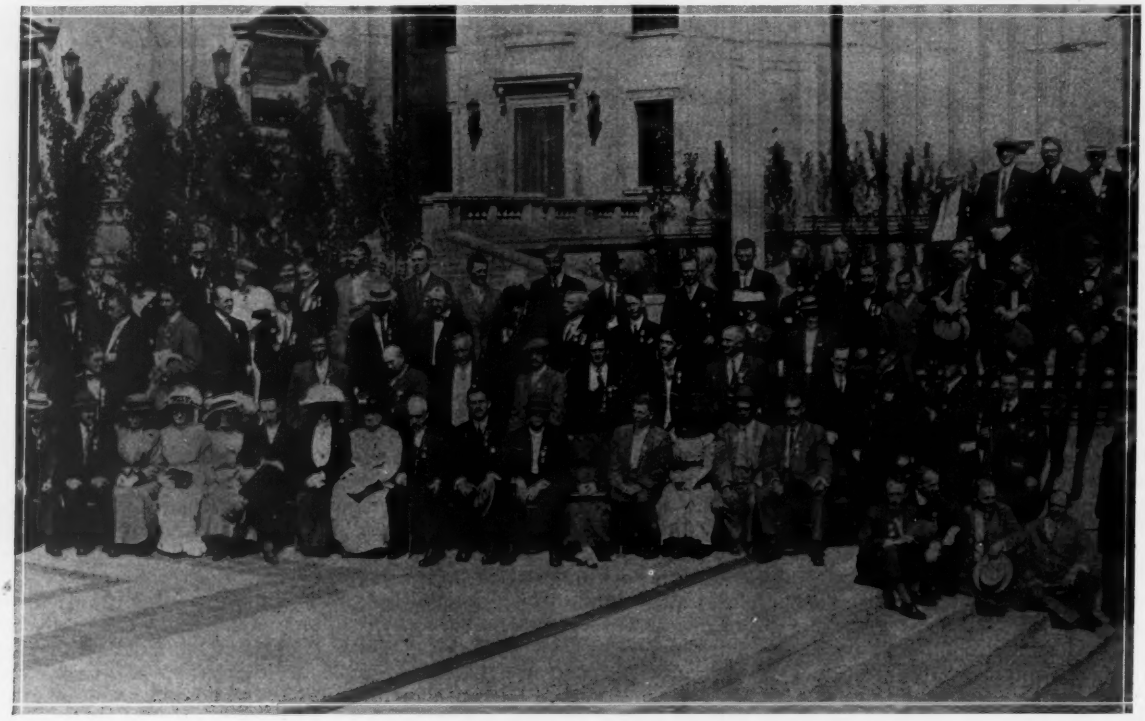


FIG. 5. SPRINGFIELD'S OLD FIRST CHURCH, 1819

Memorial service was held for the members, 182 in number, who had died during the past year, the names



GROUP AT SPRINGFIELD, SECTION E

being read by the secretary. Following this, Mrs. Heckler and Mrs. Mullen, of the Ladies' Auxiliary, told of the year's work in collecting $2100, of which over $1500 has been paid out to assist disabled engineers.

Proposed Amendments

AT the afternoon session, invitations were received from the Deane Steam Pump Co. of Holyoke to visit its plant, and from the International Congress of Refrigeration to send representatives to its meeting in Chicago.

The bond of $2000 was returned to the City of Springfield through Walter H. Damon, as all pledges had been fully redeemed.

FIG. 3. PRESIDENT M. B. SKINNER OF THE N. E. A.

Under amendments to the constitution some radical changes were proposed, to be referred to locals for vote. First the advocacy of an 8-hr. day in continuous service plants and settlement of all questions by arbitration and agreement. Second, raising the salaries of national secretary to $2500 and national treasurer to $600. Third, the arbitration board to consist of the 3 junior past presidents, the senior of these to be chairman. Fourth, power of forming local associations to be changed from the national association to state associations, and power of proposing amendments changed from local associations to state associations, and giving to each state association one delegate in the national convention. Fifth, placing control of the Association in the hands of a board of directors to consist of the president, vice-president, secretary, treasurer and 5 trustees as required by the corporation laws of New York State.

Award of prizes was made according to the report of the educational committee previously given, money prizes to individuals and a steam engine indicator to

FIG. 4. AS WE TURN FROM MAIN ST. INTO COURT SQUARE

Illinois No. 1 of Chicago and to Kentucky No. 1 of Louisville. Also altar flags were presented to associations which had made notable gains in membership.

Exhibitors' Election

DURING Thursday afternoon, ballot election was held for officers of the N. E. A., resulting in the election of Homer Whelpley, Fisher Governor Co., Marshalltown, Ia., as president; Henry Pastre, Elliott

FIG. 6. MUNICIPAL GROUP, AUDITORIUM AT THE LEFT

Co., Pittsburgh, Pa., as vice-president; Lane Thompson, The Lunkenheimer Co., Cincinnati, O., as secretary; Harry D. Raymond, A. W. Chesterton Co., Boston, Mass., as treasurer; and on the executive commit-

tee, Chas. A. Wilhoft, New York Belting and Packing Co., New York; Paul T. Payne, Dearborn Chemical Co., Chicago; Chas. T. Cullen, The Wm. Powell Co., Cincinnati; John H. Foote, McLeod & Henry Co., Troy; Jos. H. Meyers, V. D. Anderson Co., Cleveland.

In the evening a program of entertainment furnished by the N. E. A. was carried out on the stage in the Auditorium. Besides professional talent, there was singing by Billy Murray of Jenkins Bros., sleight of hand by W. A. Martell of Peerless Rubber Mfg. Co., and readings by Fred Hickey of Dearborn Chemical Co., and Jack Armour of Hill Publishing Co.

Election Day

ALL the week the pot of politics had been boiling with appearances in favor of those who finally won out, so that Friday's session was prompt in its action. Detroit, Columbus, Indianapolis, New York, St. Louis, Binghamton, St. Paul and Milwaukee were the cities asking for the 1914 convention; but it was early conceded that the choice would lie between Milwaukee, Indianapolis and Detroit, and the enthusiasm manifest when Milwaukee's invitation was presented forecast accurately its choice on the first ballot.

JAMES R. COE. NEW PRESIDENT N. A. S. E.

According to custom, Vice-president James R. Coe of New York was given a well deserved promotion to the office of president. Frederick L. Ray of Louisville was elected vice-president; Fred W. Raven of Chicago re-elected secretary; S. B. Forse of Pittsburgh re-elected treasurer. John J. Reddy of Jersey City was chosen as conductor and John P. Propper of Los Angeles as doorkeeper. Joseph F. Carney of New York was re-elected as trustee for 5 yr. This concluded the business of the morning.

To Be or Not to Be

WHETHER to hold the exhibit open until Saturday night or close Friday night was a subject of much argument and reversal of decisions; but it was finally decided that for this and all future meetings the exhibit be closed on Friday evening at 10 o'clock.

At the Exhibitors' meeting Friday afternoon the new officers were inducted and tokens of appreciation were presented to the several retiring officers. President McGrath of the N. A. S. E. was given a handsome stickpin of sapphire set in diamonds, the presentation being made by Fred R. Low. To Walter H. Damon a watch and chain engraved "Presented to Walter H. Damon by the National Exhibitors' Association, Springfield Convention N. A. S. E., 1913," the "remarks" being made by Arthur L. Rice. President Skinner, in behalf of the Association gave to Henry Pastre a beautiful jeweled stickpin in appreciation of his hard work during the year and J. W. Petersen, after a neat speech which told of the efficient team work of all the officers under President Skinner's direction, handed to that gentleman a stickpin for his own.

FREDERICK L. RAY, VICE-PRESIDENT N. A. S. E.

Decision to turn over to the pension fund of the Ladies' Auxiliary all money above $1000, remaining in the treasury after bills were paid, closed the business of the meeting.

Grand Finale

THE final session at Kimball Hotel, Friday evening, showed that engineers know how to do things up right in the ballroom as well as in the engine room. First in order came installation of the new officers of the N. A. S. E., the ceremony being performed by Past President J. G. Beckerleg, familiarly known as "Dad," who was second president of the Association in 1883 and has never missed a national convention, being now a spry young thing of 80 yr. He was assisted by Chas. H. Garlick, also a past president, acting as conductor.

Walter H. Damon, to whom the gratitude of everybody was rightfully and gladly accorded for his work preparing for and caring for the convention, was again called to the front and received from the N. A. S. E. a large silver percolator and set inscribed, "Presented to Walter H. Damon, Chairman of the Local Convention Committee by Delegates Springfield Convention N. A. S. E., 1913."

To President McGrath was given a diamond ring and a past president's badge set with diamonds and to President Coe, the Chicago delegation gave a big bunch of American beauty roses, which, of course, were immediately appropriated by Mrs. Coe.

Resolutions of thanks were tendered to the city officials, the citizens, the press, to local members of the N. A. S. E. and to the N. E. A. for courtesies during the week and their efforts which had resulted in the unanimously acknowledged "best convention that the Association ever held."

Election of officers of the Ladies' Auxiliary at the morning session resulted in the choice of Sophie Whelan of Chicago as president, Gertrude Hunt of Hyde Park as vice-president, and re-election of Mrs. Hunt as doorkeeper, Mrs. Flynn as secretary and Mrs. Stone as treasurer. These officers were installed in due form after which the ball was opened by a grand march led by Past President McGrath. Business promptly transacted as befits engineers, glorious weather, a splendid program of entertainment splendidly carried through, every possible provision for the comfort of visitors that genuine New England hospitality could conceive,—these are the memories that survive and will cause those who were fortunate in being there to look back with pleasure as long as memory lasts to the week spent among the green Berkshire hills and by the quiet Connecticut waters at Springfield.

A VISIT TO THE EXHIBIT

"COME on, let's go over to the hall."

"All right. How d'you get there?"

"Oh, just down Main Street to the square where the trees are and you'll see the soldiers' monument and back of it the old First Church; then to your right and you'll see the Municipal buildings and the big campanile. The farther one's the Auditorium where the exhibit is, and just beyond is G. A. R. Hall where the convention is held."

We started. And at the square, sure enough was the monument in its setting of graceful elms, and turning the classic lines of the church tower with its gilded rooster atop, the forerunner of the stately tower opposite which expresses the aspiration for city uplift as did the church tower that of its builders for individual uplift. Up the broad steps to the stately entrance to a no less imposing interior. Never had a gathering place of those seeking improvement of themselves and others a more fitting or beautiful meeting place.

"Where'll we start in?"

"Oh, anywhere, so we see it all."

"Well, let's go over there at the corner and take it regularly, so not to miss anything."

"All right," and over in the corner we find:

The Deane Steam Pump Co., of Holyoke, Mass., with T. B. Hiestand, A. W. Baldwin and R. M. Lepoer explaining that there are "all kinds and sizes of Deane pumps for every service" and giving "inside information" about the Deane by means of a full sectioned pump, cylinders, steam chest and valves. The new Glendora type of deep well pump was an especial hobby of theirs.

"What do you think it did?" was the question from the booth of the National Tube Co. asked by H. S. Patterson. He spoke of the number of times an N. T. C. regrinding valve had been operated before taken out of service; and the one who made the nearest estimate was to be awarded a walrus traveling bag, which rested on the oriental pattern table top made from National tube sections. We never could guess, so we passed to the samples of the Kewanee unions and union fittings and the other specialties. "Will you look at that tube?" It certainly was a sight as the picture in Practical Engineer of July 1, page 651, showed, but the well casing showed worse abuse and less effect from the dynamite than any picture could give an idea. "Oh, yes, Mr. Hamilton will be here, also W. A. Coker," was the response to our inquiry.

"Reilly Specialties? Yes, that's a multicoil feed-water heater. See those corkscrew copper coils? And this marine evaporator is on the same principle. Did you notice the multiscreen filter and grease extractor? Water has to go through the toweling to that center flange. Separators? Yes, the Goubert and the Bundy for water and oil both, and that hot water generator's worth noticing, too." It was the exhibit of the Griscom-Russell Co., W. A. Evans talking while J. H. McIntosh was explaining likewise to other callers.

"What does the machine show?" was the natural question as we stopped to greet A. W. France, of the France Packing Co. "That's to give the power used in friction of packings on rods at various speeds. Now, this is the France metallic packing in this stuffing box. See what a small current the motor takes?" The tests showed some mighty interesting comparisons.

"Took everything in the exhibit right from stock. No special fixing or finish on anything." Thus the assurance by H. C. Earle of the Walworth Mfg. Co., who had planned and arranged an interesting display of valves, fittings, piping tools, and decorated it with samples of the Genuine Stillson pipe wrench bearing the diamond trade mark.

"Geo. W. Stetson, Boston. Simplex specialties; yes, meter register, works on Venturi tubes; altitude valve, that's for water tank control; Pitot recorder, must be for measuring water flow in pipes; flow controller and gages, shows 'em working on Venturi tubes, too." And while we rambled on thus, Mr. Stetson came up and explained them all; also, that he was agent for the Williams alarm column next door, and that Walter Le Dowe and Mr. Lea were there with him.

Turning to the Williams Gauge Co.'s display, C. E. Wolff, Jr., greeted us and explained how the Williams safety boiler feed water regulator gave notice of high or low water and controlled the pump governor to give "a continuous feed" and the same idea may be used as a regulator without the safety alarm or as an alarm column without the regulator; or again to actuate a steam operated trap whose discharge is controlled by a float and pilot valve.

"What's Westinghouse got?" As we crossed the aisle. There were the 3 companies, the Electric & Mfg., the Machine, and the Air Brake, and each had a full set of booklets to explain generators and motors, gas engine and turbine outfits for all purposes, and air compressors with H. B. Bradford, C. D. Brown and M. H. Burchard to give further or special information on any of the many lines of machines and their uses.

And in Air Compressors the National Brake and Electric Co. was represented by a complete unit, motor, vertical compressor with herringbone gear drive to give quiet running and high efficiency, and storage tank, pressure from which automatically controlled the running of the motor and compressor.

"Looks good and substantial, doesn't it?" was the comment of an engineer as we came up to the models of the fire door and back arches of Monarch Boiler Arch Co. "Yes," said

I. M. Bean, representing the company, "and it's just as substantial and durable as it looks."

Then W. T. Birch, of the Hill Pump Valve Co., spoke up. "That's so, but look at what a valve has to stand, and see the result," as he exhibited a much distorted disc. "Now, these Hill valves have a metal back with a soft ring at rim and stem to fit the seat, held in position by this follower. They can't warp or twist."

Then we crossed the aisle, attracted by a full sized

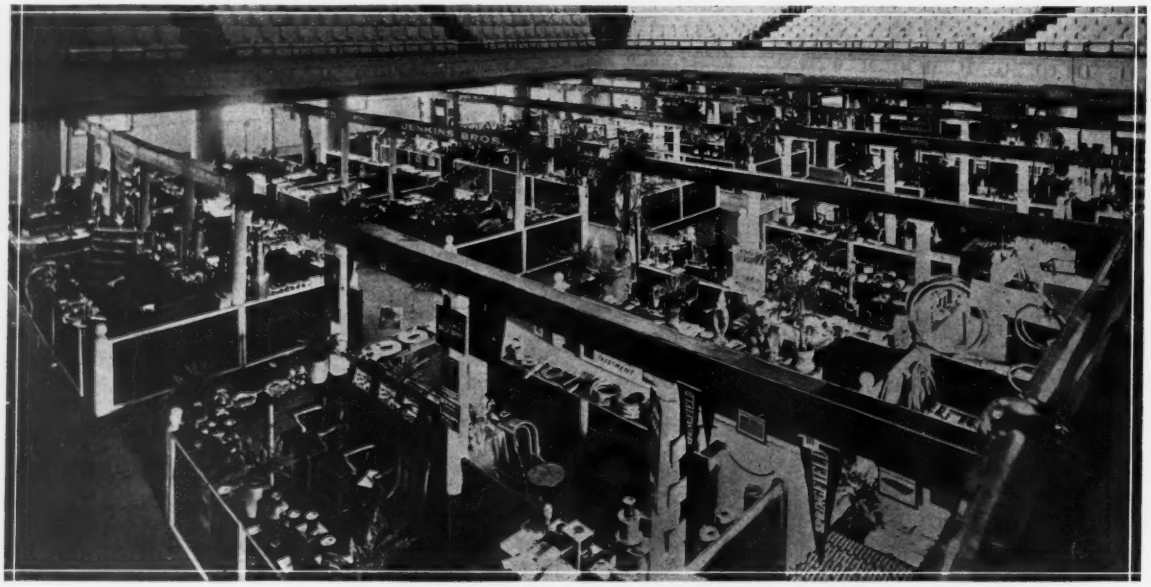
Universal Grate made by the Universal Supply Co. in which each bar was a complete unit, casting having rocking arm and journals complete. All bars on one side shake or dump together and are locked level by a latch which permits slight shaking without unlatching, but not enough motion to bring an unprotected edge into the fire. All which was explained and demonstrated by W. L. Cronin.

"Gee, but that's a load," was the natural exclamation as one looked at the platform and group of men, shown by a huge photograph in the space of the Strong, Carlisle and Hammond Co., supported by a single small "Cinch" expansion bolt fastened into a concrete ceiling. "They're a neat little device," said C. C. Plummer. "Yes," spoke up F. E. Farland, "and they do the work because they get a grip on the masonry work all around the hole, not at just 2 or 3

The name Tillotson steam trap caught our eye and we strolled on. "Yes, high or low pressure makes no difference. It works on either and equally well," was the assurance of G. T. Patterson of the Tillotson Humidifier Co. "And it's so simple; works direct on the valve and keeps the water drained continuously," added A. Boozer, another representative. "Makes no difference how much the pressure varies, she's always on the job."

"What a lot of kinds of lubricants," was the next comment, as we passed to the exhibit of the Otis Elevator Co. "Yes," said H. C. Hammond, "a good many people seem to think that anything will do to lubricate an elevator, but think of it! There's the motor, and the worm gears, and the plunger, and the guides, and the rope, besides the compression cups on bearings; and each one needs a lubricant suited to it. So we have our own special line which we know is right for each place." "See the way we put up these controller parts in cabinets?" said S. R. Millman. "If anything needs renewing, there's always a new part right here in place and it's always in good shape. Saves lots of time and bother."

"Running all right?" was the natural question as we stopped beside the working model of the Franklin valve gear used in the 20th Century Corliss engine built by the



VIEW IN THE EXHIBIT HALL

spots." "Yes. but they're no more effective than these other Strong specialties," explained R. L. Woodward; "now this engine stop really stops the engine, without fail, when there's dangerous overspeed from any cause." "And," said L. P. Strong, coming up, "this Strong trap will positively take water out of a vacuum system. We've put out over 4000 the past year, which is going some, so they must be doing the work." "Understand how all these work?" was the greeting of N. J. Allaben, of the Hancock Inspirator Co., and he proceeded to demonstrate by use of the sectioned models of Hancock inspirators and Hayden and Derby injectors, how the water is drawn up and forced into the boiler. And then W. R. Van Nortwick took up the story and explained how Ashcroft gages told all about the pressure and consolidated safety valves prevented the pressure from getting too high.

"Hello, Foote! Congratulations," was the greeting to John H. Foote at the sign of the Steel Mixture arch where McLeod & Henry Co. exhibited that interesting model of a boiler setting with a furnace arch of Steel Mixture bricks set without mortar and a Foote back arch of single span blocks. John was receiving congrats. on election to the executive committee and Adelbert Pettie explained to us that "Steel Mixture furnaces last and reduce shutdowns," while N. A. Burnham, Frank Tuthill and J. H. Foote, Jr., showed like courtesies to others.

Hewes & Phillips Iron Works. "Sure," replied W. M. Vreeland. "She always works all right. Look her over and see if you can find any trouble. See that big admission through the double port, and how quick she closes at cutoff. Everybody likes it; can't help but do so." He told us also of the points of the Begtrup patent inertia governor, of which a full size drawing was displayed.

Then a Starr came into view, Geo. R. Starr, of Greene, Tweed & Co., with his fellow representative, A. J. Richardson. Both claimed that Palmetto and Manhattan, the packings without rubber, are the real, genuine trouble chasers for rods and valve stems, and "when you get in a tight place, the Favorite ratchet wrench will get you out. Popularity based on quality proves it, and as to Palmetto, it's the lubricant in each single strand that counts."

Lunkenheimer is Cincinnatian for valves and brass goods, as Lane Thompson, of the Lunkenheimer Co., explained. "If you want an iron valve, we have it. If you want a brass valve, we have it. Globe, gate, angle, blowoff, automatic nonreturn for high or low pressure, any size you want to call for." "Well, don't think that's all," spoke up J. H. Hewetson. "There's primers, and gage cocks and compression cups and oil pumps, and lubricators and whistles, and safety alarm water columns and gage glasses and anything else in brass steam specialties you can think of or want without thinking." And W. W. Beal, Chas. Allen and H. J. Evans answered as one, "That's so."

The next was a classical number created by Homer, otherwise Whelpley, alias the new president of the N. E. A. Ought to be good at it, as governors are his line,—Fisher governors. They, the Fisher Governor Co., had them for pumps or for pressure, for reducing or relieving, for big or little outlets. One, in particular, explained to us by Jacob Eige, was of type to be used in any position, therefore especially valuable in marine work. J. H. Fisher was on hand to keep the boys industrious.

"The Davidson is the best pump built for hydraulic service, or any other for that matter," was the claim of Thomas Ellerby, of M. T. Davidson Co., as we watched the smooth, steady flow from one of the pumps in action. "The quick reversal gives no time for variation," was the comment of Wm. F. Brannon. The little 1¼ by ¾ by 1-in. oil pump was a delightfully perfect miniature of its big brother, "and," said John Lowe, "though it's the smallest pump made, it works just as well and steady as the big one."

"Buckeye-Mobile! Is it a new kind of auto?" we asked of S. H. Wheelhouse, sales manager of the Buckeye Engine Co., who was in charge of the exhibit. "Yes," he said, "it's a stationary auto for Stationary Engineers. Boiler, engine, superheater, pump, all in one compact unit. It's a one-man plant, the same as an automobile." And he explained at length the different styles and their construction, and the thorough tests that had been made before putting the American design on the market, and the astonishingly low steam and coal consumption obtained.

"Gage glass ever break?" was the question of Frank Gardner, of the Gardner Grate Co., as we were looking at a red and white column of water and wondering why. "Sometimes," we answered. Then he told us and showed us how the Igard cover protects the fireman when turning steam on a new glass, how it can be used to shield the glass from drafts and how the red lines on it give a clear and unmistakable indication of water level.

Then came up B. L. Ames with the query, "Going to Boston next spring?" And when we asked why we should, he came back with a vocal prospectus of the New England Power Show, and the New England Association of Commercial Engineers, winding up with the directory of the latter and application for space in the former.

"You are now inside the setting. Watch what happens when I work this lever. The steam jet starts above the fire to give extra air and continues until the piston moves up and operates this trip; then it closes off." It was Mr. Ames still talking, but now as representative of the Climax Smoke Preventor Co., and explaining the action of the presenter after putting in fresh coal.

"That? It's the new Monarch Steam Soot Remover for water-tube boilers and superheaters," was the reply of J. E. B. Gibbons to our question about an exhibit in the same booth. "These shutters open and let the jet nozzles swing in over the tubes to do their work. Then they swing back and the shutters close. This casing goes on outside the nozzle mechanism and makes everything air tight. Of course we have the blower for fire tube boilers, too."

Then there came a burst of melody (?) and we discovered A. R. Foley, of the Home Rubber Co., having a rehearsal of his famous glee singers, at any rate he sang with glee. Dick is just back from a sojourn in England, so he has some glee on his own account. But he and Chas. Green are most gleeful and enthusiastic when singing the praises of Ebonite and N. B. O. packings, the kind that never blow out.

"What dandy photographs!" exclaimed an engineer, as we came to the booth of Elliott Co. "They tell every detail of those heaters and you can almost see 'em work." And he and Henry Pastre entered on a lively discussion of the action of separators for steam and oil, strainers, filters, feedwater heaters and round and square type both single and twin, and the various other Elliott power accessions which this company makes.

Meantime, E. L. Davis, of Liberty Mfg. Co., was enlightening us as to the details of Liberty tube cleaners, the difference between air, steam and water driven types and the uses of spear heads, spur heads and chisels for getting heavy scale out and keeping tube surfaces clean.

"You're face is dirty. Look into that," was the greeting from "Mort" Skinner as we approached the booth of James McCrea & Co., and he held one of his little mirrors up to nature, meaning us. But then Mort always did like to explain our shortcomings. Now, C. A. Thomas, who was working there, gave us a real explanation of just how Emergency pipe clamps and Climax joint clamps come to the rescue when leaks annoy. And the Skinner valve and faucet reseaters are bringing joy to the hearts of users. Also the Butman patent flue rod helps to clean house in the boilers; perhaps Mort was thinking of that when he hinted about our face.

Nearby Jack Holman, of the Mining World, was to be found when he wasn't somewhere else. For Jack is progressive and believes in keeping moving.

"This 1-in. trap is drawing water from a vacuum and discharging into the air." So read the legend on the exhibit of the Lytton Mfg. Corp., where J. W. Lytton, president, and D. J. Lewis, Jr., were explaining in detail the action of the trap and system. Compressed air was used for pressure in place of steam, which made the operation more difficult. A special feature was the self draining float which insured the same pressure inside and outside the float at all times, yet kept the float always free of water.

Interesting reminiscences were related by Robert Gerald, one of the early presidents of N. A. S. E., as we chatted with him, L. C. Parker and F. A. Shute of the Nightingale & Childs Co. about the Ehret pipe coverings, Ambler roofings and shingles, and more particularly the Swartwout separators, cast-iron exhaust heads and ball bearing ventilators. The success of the ventilator in handling large quantities of air, even surprising those who were most familiar with it, and the selling of ventilators on guarantee of performance were unfailing inspiration to H. H. Lind, who was special representative of the Ohio Blower Co., which manufactures the Swartwout specialties.

"Look at that big percolator boil," said a lady engineer as she paused where the Wickes Boiler Co. was operating its model of the Wickes vertical water-tube boiler. A glass top and openings gave a good view of the rapid circulation and steam disengagement produced by the special arrangement of tubes, while James Milne, E. F. Baker, J. W. Hulihan and J. M. Glenn told of the interesting details of construction and guarantee of performance.

"Great grates those!" He didn't mean to make a pun, but A. H. Vaughn was in earnest as be explained the construction of the McDonald sectional shaking grate with steel bearers made by the International Engineering Co. And he, W. H. Walker and G. H. Conner demonstrated to us not only the greatness of those grates, but why the Robb-Armstrong boiler made a great deal of steam. D. W. Robb, Jr., was also expected at the convention.

F. W. Goldthwaite was awaiting us as we stopped to examine the models of boilers with blowers attached in the booth of the Diamond Power Specialty Co. There was the application to the h. r. t. type, to the vertical tubular and to various types of water-tube, both horizontal and vertical, showing just the action of the Diamond soot blower in each type.

The "Will it Pay Department" of the Richardson-Phenix Co. attracted our attention for its novelty. They (i. e. J. Wm. Peterson and Edwin M. May) were, of course, interested in explaining the Richardson individual oiling system with its sight flow indicator, its inclinable plunger oil pump, its single and multiple feed round and square force feed lubricator and its compression coupling and fittings piping. But the question they want to answer for any plant is "Will it pay you?" and that's why the department is.

"Wm. R. Winn, Engineers' Supplies," read our companion as he came to the next exhibit. "Sign's wrong; ought to be Wm. R. wins, and he ought to. Look at the line he carries." And the convention with W. N. Winans, J. B. Harrington and Frank Driscoll turned on Emergencies and their clamps, Durabla glasses and discs, Philadelphia grease and cups, Palmetto twist, Jenkins valve discs, N. B. O. sheets, Penberthy injectors and other specialties.

Soon "Happy Jack" Carson came over from the space of Durabla Mfg. Co. next door. "And why shouldn't I be happy?" he asked as we greeted him. "Look at the line we make. Of course, you know the Durabla gray sheet, and how those Durabla gage glasses stand up. It's really no wonder folks sometimes make a mistake and call them Durable. But here's a new one." And as we came to the booth he introduced W. G. Werbeck, who described at length the merits of the Durabla spiral flange packings made for manholes or handholes of any size or shape from a coil of square packing. Those big red bows were mighty nifty against the dark gray of the packings.

"Can you give me a yard of diagrams?" was our joking question to W. L. Trill of the Trill Indicator Co. But the joke was on us for he came back, "Yes, sir! or 10 yd. or 60 if you want them." And he proceeded to show us how it was possible to take a continuous series of diagrams, each

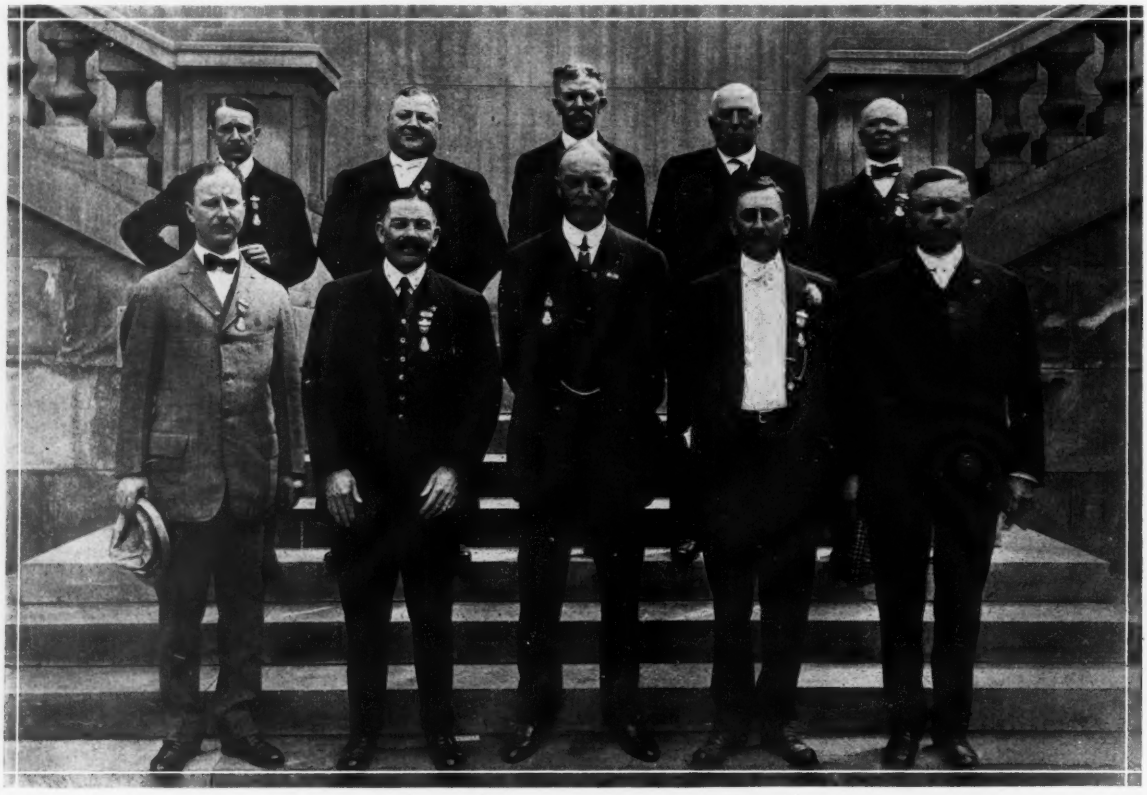
separate from the other as long as wanted up to a record strip of 200 ft. long, and how this could be applied to either inside or outside spring Trill indicators, cards of any length given by the Trill reducing motion, and the m. e. p. worked out with a Trill planimeter.

"No, it's not a weighing machine," patiently explained H. E. Bingham, of the Builders Iron Foundry, as we continued our effort at persiflage. "It's a measuring machine to show and record the amount of water passing through this Venturi meter." And he gave us a full explanation of its working, how it made the charts, and how these were averaged up by a special planimeter for circular charts to get total flow and average rate. Also the barometric type of indicating meter was shown to tell at any time just the speed at which water was passing, and the fact that either hot or cold water could be accurately measured was emphasized

As we turned to the exhibit of W. J. Hyland Mfg. Co., Fred C. Greene turned to us and explained, with the use of sheet, while for pumps and rods the Crocrite spiral was offered and for valve stems the Turxo lubricated packing in spools.

E. N. Marcy, for Clement Restein, said: "We make no charge for the hole," and he and A. H. Foster explained further that the hole in the center takes up expansion as the packing becomes heated, thus reducing friction on the rod, and as the packing is sold by weight, it gives extra length to the pound. Among the palms and gladiolas of the booth were arranged samples of all kinds of Belmont packings in sheet, spiral and ring form.

Many familiar names were encountered as we examined the display of Schumaker-Santry Co., and Nelson Hibbard called attention specially to the Simplex pipe and joint clamps and blowoff valve, Nelson valves with novel metal part for superheated steam, the Lea recorder for measuring water flow and the Terry steam turbine unit, for adaptation to driving pumps, fans, blowers, etc.



NEW OFFICERS OF THE N. E. A.

a cut out specimen the way that Bashlin valves and faucets close with the pressure into a circular chamber as well as against a seat, so that the seat can be renewed with the line under pressure by letting the valve disc come forward into the chamber. The stem can also be repacked under pressure by seating the upper side of the disc against the bonnet. W. J. Hyland also came up and took part in the explanation to show how easily the valves or faucets are operated.

All four of the representatives of Crandall Packing Co., J. M. Chapman, Geo. H. Kendrick, E. A. Ware and C. B. Whitman were busy at all times, but stopped courteously to explain the properties of Rex sheet packing No. 1920 for high-pressure steam, hip rod packing for hydraulic work and Rex spool and air pump packing. Also to show the advantage of shipping all packings in tins as is now done to prevent drying out of the lubricant.

Next, beyond the administration booth were the packings of the New York Belting and Packing Co., with Chas. A. Wilhoft in charge and F. E. Friedlander and H. C. Hicks assisting him. In the display were noted the Indestructible white sheet packing, Ruby red sheet and Firo asbestos

Burning iron attracted great crowds and we stood for some time fascinated by the skill and rapidity with which all sorts of shapes were cut from ¼-in. plate by the white hot blast of oxy-acetylene used in the Oxygraph in the booth of the Welding Co., where Henry Cabe, president, Harry Hoag and H. Tingley were in charge. Other uses shown in the display were repairing of steam boilers, and an all welded boiler for steam and hot water heating. Cuts up to 7 in. deep can be made by this process.

"How to save 80 per cent of your annual fuse expense." This certainly looked interesting, and we stopped for further information from the Economy Fuse & Mfg. Co., whose renewable cartridge fuses from 10 to 600 amp. capacity were arranged in a striking pattern. Full details as to how the fuse strip could be readily renewed at slight expense were given by R. Hopwood.

"It laces them just like this," said W. K. Lee, of the Clipper Belt Lacer Co., as he proceeded to an actual demonstration of how it was done, and called attention to the smoothness of the joint in which the wires are counter-sunk into the leather so that the joint cannot be felt as the belt passes

under the fingers at high speed. Its durability has been amply proved also by long runs over small pulleys at high speed.

Our new treasurer, Harry L. Raymond, with T. F. Walsh and A. B. Parke, smiled a cordial welcome as he told us how Sonderglas lasts in a water gage, and the virtues of Metalbestos for high pressure and Chesterton combination packings for steam and hydraulic machinery. Endura and Russo sheet came in for discussion too as well as the Combination tube scrapers and cleaners.

And we passed to the Marsh pump, whose innermost anatomy was shown and explained by S. C. Byce and T. J. Morford, of the American Steam Pump Co., by means of a sectional pump and parts of the pump, and the air compressor which, they assured us, "never short strokes and is good for boiler or condenser work, for deep wells or high vacuums."

No more steam or water blasts into the boiler room when a gage glass breaks if you have a Watertown automatic safety water gage with chain pull cocks and automatic ball valves was the conclusion reached after hearing the story of this device as told by L. L. Berg and L. W. Moore of the Watertown Specialty Co.

"You see the screw is in the bonnet, not on the stem, so there is no steam pressure around the stem and no need of packing. That's why we call it the Syracuse Packless valve. The disk is renewable, too, so it is good for practically all time." Thus J. Brightman, of the Syracuse Faucet and Valve Co., explained the features of its product.

Next door was J. Henry Blanchard, manufacturers' agent for the products of the Flexitallic Gasket Co. and Linco soot destroyer. The former are gaskets made up of spring steel strip wound up in spiral form with a filler of treated asbestos between the spirals to form the packing medium. Linco, a preparation to be used on the fire, has chemical action to remove all soot from the tubes.

"Want a pipe bent?" We didn't just then, but if we ever do, we shall know where to get it done, for John Hickey and Arthur H. Day, the secretary of the National Pipe Bending Co., had on display examples of all sorts of pipe, both thick and thin, bent into all kinds of impossible shapes. Some of the bends were used in the National coil tube feed-water heater, which was shown, as was also the National Direct Contact feed-water heater and separator.

We could actually see the water boil in the sectional model of the Bigelow vertical watertube boiler, whose action W. F. Sargent and S. H. Barnum, of the Bigelow Boiler Co., were explaining. And to give an idea of the strength of the parts in the actual boiler, some steel nozzles, covers and sockets were shown natural size.

"They're Toledo tools, and you see right here that with them one man can cut and thread any size pipe up to 12-in., either in the shop or right on the job." It was W. C. Longenecker, of the Toledo Pipe Threading Co., speaking as he with C. A. Popp and L. H. Irwin were showing in the midst of a bed of greenery and flowers just how easily the Toledo tools work on various sizes of pipe. Fitting up lines of large pipe with such conveniences would seem almost as luxurious as the bed of roses in which they were placed.

Those streams of oil which flowed from the Bowser oil filtration and circulation system certainly looked clear enough to be appetizing on a meal of wheat cakes, and the collapsible filter when closed up looked not unlike a huge "stack of wheats" for some powerful giant's feast. It was a real life size system, with storage tanks, pumps, and filters complete and Messrs. D. A. Corey, J. R. Sibley, H. E. Dobson, S. F. Taylor and G. P. Kamps, who were in charge of it explained minutely just the course of the oil through it and what part the various processes played in the thorough cleansing of used oil.

"Good old wrought iron pipe will stand a lot. Just look at these examples and they tell the story; we don't need to say anything." This from G. Frank Uhler, representing A. M. Byes & Co., whose product he had in charge. It was a good exemplification of what goods honestly made from good material can accomplish.

"It doesn't pay to get your motor oils too light. I've been using an oil much heavier than common, and my engine never ran so well before," was the testimony of Chas. H. Flynn, of the A. W. Harris Oil Co., and he, as well as Howard Gaunt, who represented the same company, have had a lot of experience in oil blending and could tell you all about how the various oils, of which numerous samples were shown, should be combined to make the best lubricant possible for any given conditions of bearing load and speed. The "moving picture" story of Bill and his oils was a great attention catcher.

"Where's that draft coming from?" was our natural question, as a strong blast struck us. And Franz G. Coppus, of the Coppus Engineering & Equipment Co., replied, "That's the kind our Coppus turbo blower always makes. You see it has a strong, efficient turbine wheel to drive it, and the ball bearings make it run easy, so naturally it makes some considerable breeze. And the exhaust steam goes with the air blast which makes it still breezier."

Everything for handling exhaust steam was found in the display of the Warren Webster Co., in which John Montgomery and Harry Bowers showed us motor valves for the control of coils and radiators on pressure or vacuum systems, heaters for feed-water, air conditioning and washing devices, steam and oil separators and the Webster sylphon bellows for use with the Webster system of vacuum heating.

"Graphite helps lubrication; why not use it. We have the pump which will handle graphite and oil, and keep the graphite always in suspension." Thus preached William Schatz and W. W. Roberts, of L. Sonneborn Sons, Inc., and they practiced what they preached by aid of the special force feed oiler with a stirrer in the bottom of the oil reservoir, which kept the mixture agitated all the time and prevented any possibility of settling.

A Corliss valve gear, which never lets go but holds the valve stationary during admission and from cutoff to valve opening, was demonstrated by the model of the nonreleasing gear of the Ball 4-valve engine shown for the Ball Engine Co. by V. F. Holmes. The action was the same as for the drop cutoff gear and can be run at any speed. Photographs and bulletins gave full details of the construction of all parts of the engine.

Petroleum and its products make up the field of activity of the Texas Co., whose representatives, H. E. Shaw, H. L. Buchner, H. S. Crocker and M. H. Holden were always ready to discuss any problem in lubrication or other use of oils from oiling roads to roofing and from tar to gasoline.

Belts of all kinds were our find at the space of Graton & Knight Mfg. Co., from a 60-in. double belt to a little round sewing machine cord. One interesting style to which attention was called by F. W. Colburn and R. H. Jackson was the V belt for use on grooved pulleys in variable speed transmissions. "The harder you pull, the tighter it grips." Belt dressing, preservation, cementing and lacing were among the allied interests displayed, also cup leathers and special shapes for clutch bands and packings.

A good line of good specialties came up for study in the booth of Walter G. Ruggles Co., where Mr. Ruggles and J. J. Monahan were actively engaging the interest of visitors with White Star oil filters, Sterling Lubricators, Vance Traps, Baum Separators, Blackburn water filters, a model of the Martin shaking grate, Vance compound blowoff valves, and Everlasting blowoff valves. The Vance is really 2 valves in one, the outer one being of cylindrical gate form and the inner with a bevel seat, thus giving 2 places to make steam tight joints. J. A. Coutts was present as representative of the Geo. M. Newhall Engineering Co., which manufactures the Vance specialties.

A clear bubbling drink was most welcome after the time spent in walking and talking. It came just right for comfort from the Puro Sanitary drinking fountains which were being demonstrated by Edward S. Christiansen, of the Puro Sanitary Drinking Fountain Co. Then he told us of the adjustability which gives a steady full flow without splashing or overflow and the extra strength which makes the fountain unbreakable under any ordinary usage and the simplicity leaves little possibility of getting out of order.

Steady and regular rise and fall of the Bundy traps attracted us to the exhibit of the Nashua Machine Co., and as we watched them John Sabin, manager of the company, explained their action as tilting hot water pumps drawing water from a tank under pressure to represent the boiler by means of a tank or separator trap and discharging into an open tank; drawing from this open tank by means of a lifting-tilting hot water pump and discharging above the tank into a similar Bundy pump, which, in turn, sent the water back to the "boiler." Other uses and combinations were explained by W. E. Van Keuren, E. M. Stevens, C. F. Smith and F. A. Littlefield, the inventor of the Bundy traps, such as the lifting of hot water 33 ft. under 25 lb. pressure.

Cancos Mfg. Co. was the sign at the next space, and Cancos was the trade name by which the semimetallic expansion rod packing, the stranded valve stem packing and the metal polish displayed were known. Other types shown by J. J. Sullivan, for the company, were Black Squadron round, square and sheet for high and for low pressure.

Successful plants and installations using the Jones Underfeed Stoker were shown in photographs and blueprints by Wm. T. Johnson and Chas. L. Weeks, of the Underfeed Stoker Co., of America. Bulletins and circulars showed the economy secured in these plants by the use of these stokers, both in reduced labor and increased furnace efficiency.

"Away with trouble! Let J. M. do your work." Thus was the spirit at the booth where T. B. Constant explained the use of J. M. high temperature cement for laying fire brick in furnaces and of J. M. boiler preservative for preventing scale formation and pitting or corrosion of plates. A large photograph of the interior of a furnace in use for a year and with all parts intact was a convincing proof.

Now up to the main floor, and to one corner so that nothing be missed, we find Crane Co. with a big display, including globe and angle valves, union valves, safety valves, automatic stop and checks in Y and angle patterns, the Crane-Erwood check and nonreturn valve; and besides these W. L. Oswald, J. J. Kirby and Mr. Wolcott took turns in operating and explaining a demonstrating outfit of direct return, nonreturn, lifting vacuum, condensing and metering traps, all operating by compressed air under conditions even more severe than those of the actual plant.

Gravity test for oils was shown by the American Oil Co. in connection with its display of oils, belt dressing, greases and automobile soap in charge of W. L. Davis and S. F. Babbit.

Where the Daily was found at the booth of National Engineer, J. W. Lane, R. W. Larkin and C. F. Ceilley also had in charge the lantern slides and lecture notes of the educational committee and other papers of the N. A. S. E.

GROUP OF EXHIBITORS AT

The big bright sign of the White Star gave a most illuminating introduction to the large and fine display of valves and other brass goods made by the Wm. Powell Co. This was presided over by Charles T. Cullen and James Coombe, and included Powell union valves with composite disc, White Star valves, nonreturn valves, injectors, blowoff valves, compression cups, oil pumps, lubricators and other specialties for power plants.

At the sign of the roses, we found H. A. Smith and T. A. Collins, of the Philadelphia Grease Mfg. Co., showing "all kinds of grease" and how the different consistencies could be tested to determine their availability for any work.

Thus we came to the last booth on the exhibition floor, that of The Fairbanks Co., and found there L. B. Mann and G. E. Hollister with pyramids of Dart Unions of all sizes, Fairbanks valves for ordinary service and Sphero valves for blowoff or other severe service. There were also a full line of Dart union fittings, and Mr. Mann put it that "they are the only unions I'd have in my plant, either on the lines or off."

Education for Progress was evident in all parts of the exhibit of the International Correspondence Schools, whose representatives, W. S. Gould, J. M. Reynolds, J. B. Brosnan, H. A. Sisson and Edward Allen talked interestingly of the ground covered by the text books shown, the quality of the instruments furnished to students and the excellent work done as shown by the drawings and examination papers sent in by students and on file at the booth.

"Grease the shafting with Kent grease and our patent shafting lubricators," was the advice of L. H. West, of the Kent Lubricating Co., as he handed us a memorandum tablet so that we could write it down and not forget it.

For some time we stood watching the action of the Brown patent releasing gear, used on the Harris-Corliss engine as illustrated by the full size gear in operation. The perfect catch and trip, and quiet dashpot were delightful and the talk with L. O. Greene and A. M. Crowell was instructive and pleasant. They also showed us the valves and other parts of the engine, which is built by the Wm. A. Harris Steam Engine Co.

With the Springfield Board of Trade exhibit we found H. W. Margeson and J. C. Hourihan, who also represented the Western New England Magazine and had charge of making photographs at the convention.

"Well that's certainly a novelty," was the expression of a delegate as we came to the exhibit of Monarch Valve & Mfg. Co., and attention thus attracted we found a gate valve with the outlet end having an automatic drip connection which opens when the valve closes, and is closed by the pressure when the valve is opened. "You see," said W. O. Hosley, who with W. D. Hosley was on duty at the booth, "that keeps the valve and line always free of water of condensation so that it isn't necessary to put in a drip line and extra valve on the outlet end of the line. With one of these valves at the lowest point, the line is automatically and constantly drained and no chance to forget to open the drip."

A single regulating mechanism for pump governors, relief valves, regulating valves, reducing valves and float valves with the parts interchangeable on all devices for the same

It was a big representation, that from the Garlock Packing Co. from Claude D. Allen, genial and smiling, through P. L. Rogers, J. I. Gaton, F. P. Lythgoe, L. H. Harris, C. B. Whitehous to T. C. Greene overflowing with good humor. And they all talked Garlock, from pump valves to special gaskets and from No. 900 white sheet to metallic rod packing.

"Here's a new one, only it isn't," said N. C. Copley, of the S. C. Regulator Co., as we hove to before the ebbing and flowing tide in his water columns. "It's the same feed governor and mechanism only we've straightened out this tube which used to be curved, so we get rid of friction and pockets and give a steadiness that some folks think is impossible." And we turned our attention to the working exhibit where H. S. Fraser was showing the difference in fluctuation with hand regulation of feed and S. C. regulation by the S. C. Vertical boiler feed regulator. Some interesting charts from the N. Y. Edison Waterside Station No. 2 showed what the regulator accomplishes in steadiness of water level.

THE SPRINGFIELD CONVENTION

size pipe and between those for several sizes of pipe, was explained to be the principle of design and manufacture followed by the Atlas Valve Co. in producing its Atlas specialties. D. L. Dalrymple, the designer, and C. T. Schmitt, were active in their demonstration and explanation of the working exhibit.

"The story of some friction tests" was told by H. Rittenhouse and H. A. Howe, of Quaker City Rubber Co., as they talked of the action of Daniels PPP expansion rod packing under varying temperatures and steam pressure. Other products of the company which interested us were the Ebonite sheet packing, those emery disks for regrinding valve seats either flat or bevel, the steam hydraulic and wire wound hose and Quaker tires of special fabric and tread.

"Erusa, asure" cure for belt slipping, used either forward or backward works equally well. Thus C. F. Chase, of the Cling Surface Co., explained the riddle and went on to tell of the help that Cling Surface has been in thousands of cases of belt trouble, to cure slip and do away with over tension on belts. J. D. Bresnihan was likewise spreading the gospel of loose belts and distributing "tracts."

The Red and Blue, a red keystone on every blue can, gave a pleasing color scheme to the exhibit of the Keystone Lubricating Co., where Charles Hopper, J. W. Gordon, H. L. Carpenter, George Mahan and M. B. Urquhart were busily explaining how Keystone Grease can be best used for journals, cables, shafting, hangers, automobiles and motors, "a grease for every purpose, even butterine your bread," as Hopper said.

Lubrication insured was the motto of Hills-McCanna Co., whose booth was in charge of Robert E. Hills. As a background for the force feed lubricators, gage cocks, low water alarm, and swing joints for oil or grease lubrication of bearings, a profusion of ferns and palms gave restful picturesqueness.

A real garden spot this, for across the aisle we found a real fernery with easy chairs and Turkish rug and inviting hospitality. The hosts who acted here for Lagonda Mfg. Co. were M. M. Sellers, J. P. Maloy, Hart Hill, E. E. Hauer, W. R. Danley, J. H. Johnston and W. J. Patterson, certainly an imposing array of courteous gentlemen and all deeply interested in having us fully understand and appreciate the

Lagonda specialties. As for instance, the multiple water strainer, of which a 40-in. triple, 12 ft. high and weighing 33,000 lb., was recently shipped to the California Edison Co. The roller-bearing, water-driven tube cleaner with tapered rollers running in grease; the new type air-driven turbine cleaner; the revolving vibrator cleaner for horizontal return tube boilers and the vibrating attachment to fit any cleaner for any return tube boiler.

"Twenty-five years ago" was the title of a clipping from the Springfield, O., Daily Republic which Mr. Sellers gave us and it came remarkably apropos; it was a reprint from that paper of the date Sept. 9, 1888, and read as follows, and refers to Mr. Hoppes, of the Hoppes Mfg. Co.:

"Mr. J. J. Hoppes, of this city, has been attending the National convention of the N. A. S. E. at Minneapolis. He states that the convention has established a mutual insurance scheme to be known as the Life and Accident Association of the N. A. S. E. All agree that the work of this convention will greatly strengthen the organization, as some important changes in the constitution have been made, and officers elected from the ranks of working engineers. He sends the following clipping:

"The Stationary Engineers' national convention adjourned yesterday, and in the evening there was a banquet at National Park. The closing session was held at Germania Hall, on Grand avenue. Some changes in the constitution were made, and complimentary resolutions were passed, after which the election of officers was held."

"Isn't this a new field for you?" we asked of Jos. H. Meyers as we came to the sign of V. D. Anderson Co. "Well!" said he, "it's new to the market, but it's been in use a long time in our own plant. Now just look at the simplicity of that safety water column. A round copper ball floating in the water. When it gets too high it strikes this upper arm; when it goes too low it drops on the lower arm; in either case a simple direct action opens the whistle valve. Then this vertical steam separator; it operates by centrifugal force to throw all the water outside and then the steam has to double back into this cone shaped nozzle to pass on. Those baffles are built up so that no imperfections can get in, and the tests show 99.6 per cent dry steam with no measurable drop in pressure through the separator. That trap? It's for taking air out of heating systems; just a regular Anderson trap only mounted reversed to remove air instead of water." We saw also at the booth L. A. Couch, F. M. Couch and R. E. Bronson.

"Yes it's the same one you've seen before and, of course, working as well as ever. It's a genuine Squires trap," said J. G. Boyer, of the C. E. Squires Co. It was the trap familiar to convention goers, working on compressed air at high pressure, so sensitively that no air gets by it. There was also the little aluminum hand pumped model, and a full line of pump governors, reducing valves and other Squires devices. We met Mr. Squires frequently about the convention and exhibit halls.

And in the space of the Evans Mill Supply Co., which handles the Squires devices in New England, was found the Squires automatic boiler feed water controller acting on the inclined expansion tube principle. We found F. H. Evans, F. S. Evans and C. J. Howe all enthusiastic over the record of Squires Specialties and eager to show, also, the action of the Falls engine stop which they sell.

This Falls engine stop is made by the Falls Machine Co., and J. H. Raymaker and F. S. Palmer, who represented the company, showed us the workings, including the packingless valve and the positive tripping action which makes certain that the engine will be shut down if it goes above the desired speed.

We had often heard that frequently low first cost isn't economy, but Harry H. Atkinson, of the Economy Grease and Lubricating Co., put it into new form. "Buying cheap goods to save money is like stopping a clock to save time." And from that he and J. F. McCurdy proceeded to show just why Economy grease is superior.

Here was another oasis with palms and cool water to refresh the thirsty. It bore the sign, A. Leschen & Sons Rope Co., and was in charge of F. N. Chapman with an exhibit of all kinds of rope, but emphasizing especially red strand Hercules hoisting and transmission rope and elevator cables.

At the next booth, that of the Armstrong Cork Co., where the 2 Geo. R.'s, Herrick and Henderson, reigned, we learned how to build a home out of sheet cork that would be most successful for refrigeration or ice storage and how to insulate cold water, brine or hot water pipes with Nonpareil cork pipe covering. They told us an interesting story, too, of the composition of the material used in Nonpareil high-pressure covering with its millions of minute air cells and showed us what resistance it offers to passage of heat of high temperature. Norristown Magnesia and Asbestos Co., agents for the Nonpareil coverings occupied the adjoining space.

American is the patriotic trade name which naturally goes with the specialties of the American Steam Gauge & Valve Mfg. Co. They include gages, safety valves, whistles, a new form of steam trap and the American Thompson Improved indicator, one of which we were informed by U. H. Nickerson and J. E. Swendleman was won by Illinois Association No. 1 of Chicago in the educational meeting contest.

"Old Bill" Sanders was "awful busy" when we came up, distributing those smokers' delights, so W. C. Edge gave us the fine points of the P. B. H. gage cocks and fittings made by the P. B. Huyette Co. and of the other specialties which that company handles, among them Reliance Safety water columns, Reliance traps, the Hayes gas analysis instruments and draft gage and the tornado tube blower. Mr. Huyette was at the convention for a short time.

Many products already investigated were noted in the exhibit of the Hartford Mill Supply Co., such as the S. C. Regulator, Everlasting blowoff valve, Powell White Star valves, Strong specialties, Durabla packings, Dixon graphite and greases, Jefferson Unions and Skookum diagonal cross-expansion packing. The representatives were H. E. Woodman and C. A. Sleeper.

"Feed water carefully analyzed" and "Compounds made scientifically" were the signs flanking the exhibit of oils, constituents of compounds and analysis of waters which were displayed in the booth of W. B. McVicker Co. And we were let into the mysteries of the process, which after all are plain common sense application of science by Mr. McVicker, A. T. Camden and J. Hammill.

A haven of rest with couch, luxurious easy chairs, flowers, rugs and interesting pictures of "the old plant and the new" formed the comfortable setting (or should it be sitting?) in which a numerous corps of representatives of the Chapman Valve Co. told the story of Chapman gate valves in bronze and steel and demonstrated the action by motor and hand operation. An interesting feature of the booth was the cup presented to President A. N. Gilbert by the Local Convention Committee. Those in attendance for the Company were: W. J. Neville, F. W. Sleep, C. F. Webber, A. E. Tomlinson, J. McC. Moffat, D. P. Joralemon, C. F. Chaundy, Victor Bingle, Thomas Radley, M. J. Konold and H. E. De Wolf.

"When you're tired of resting there, come over here and rest and hear the birdies sing," was the greeting of Dan Delaney from across the aisle where another rest cure was provided by the Dearborn Chemical Co. The space was as usual a bower of flowers and the center of a large crowd seeking "singers," hammers and perfumes, and getting besides much information on proper treatment of water for boilers from their old friends of the Dearborn staff, J. G. Beckerleg, Dan Delaney, P. H. Hogan, Fred Hickey, Thomas Platt, Paul T. Payne and Mr. Amsbury.

For Practical Engineer we found J. O'Leary proving to the uninitiated what you, as a reader, already know, that it's the engineer's best friend at every turn. Editor Rice was on hand frequently, and about the hall were seen E. R. Shaw, C. B. Leech, J. A. Kershaw and S. B. Luccock.

The Vanda Girl attracted us as she did many others by her own graces and the tasteful background she had arranged of bright red ribbons in pleasing contrast to the black rolls and boxes of Vanda packings which included the pioneer compound sheet, the well lubricated piston rod, the tubular gasket with braided jacket for high temperature and pressure, and ammonia packings for pistons and rods. In charge of the display were F. Hasenclever, manager, and Fr. Kerscher, superintendent.

"We clean the City's sky line" was the challenger of attention which caught us at the space of the Atbe Smoke Consumer Co., where F. H. Dumbleton, N. P. Bissonette and H. C. Ray, treasurer, demonstrated the action of this ingenious device.

"The Arrow process of water treatment" was being actively set forth by E. M. Swindler, of the Arrow Boiler Compound Co.

"You see it works on air or steam or water. It will go through straight or bent tubes. Its action will take all scale off and its mechanism is the ultimate of simplicity." P. C. Smith, representing The Roto Co., was very much in earnest as he explained to us just how the Roto tube cleaner

operates and the use of the different heads for different scale conditions. The display of various types in operation on compressed air drew many besides ourselves to see and hear his talk. P. J. Darlington was in active charge at the booth during the convention.

"Squeeze it in the vise, and notice how it expands crosswise. That's just the action in a stuffing box or pump and that's why we call it cross-expansion packing; the diagonal part of the name comes from the diagonal arrangement of the fabric which is what makes the cross-expansion possible." Thus did David J. Fleming, at the stand of the Bowers Rubber Works, explain the why of Skookum diagonal cross-expansion packing. But he didn't explain the "Skookum" part. We are yet curious.

"Curious handles, aren't they?" was the comment as we looked at a handsome carving set—knife, fork and steel—in a show case at the booth of J. A. Roebling's Sons Co. Then we noticed the placard, "Forged from Roebling wire rope," and J. F. Troescher explained that the handles were the rope in its natural condition, while the blades and prongs were formed by welding the stands together into a homogeneous mass, forming this to shape and tempering, which showed the high quality of steel which the rope must have contained. With him at the booth were Edward C. Cockey and Elmer A. Noden.

Lewis Grease Cup Co. had a booth, but no representative or exhibit was in evidence.

"Dannbil Does," read the sign at the home of the Dannbil Co., and from the excellent variety of Dannbil and Hudsonil packings displayed, sheet, gasket, ring, spiral and hose, it seemed likely that it would do anything that a packing should. President G. G. Schick was in charge, assisted by F. I. Fenry and J. E. Dubois.

It had been a long trip and our legs began to remind us that they could tire, so it was with relief that we beheld another "rest house" and accepted the cordial greeting of Frank Martin at Jenkins Bros. to "come in and sit down," among the greenery which matched so well the green tints of rugs and chairs. There one could study at leisure the construction of Jenkins globe valves with the familiar J in the diamond, the new Jenkins union valves, the separate parts of iron and steel valves, gage cocks and traps, and the qualities of Jenarco sheet packing, the tubular gasket and the Jenkins valve discs. Besides Martin there were acting as hosts: Billy Murray, whose songs are as popular as ever; H. B. McClelland, R. H. Stiles and F. G. Jolley.

Over there we spied Columbus. Everybody knows Clum Dill and where he is there Ashton products are under discussion. And it was so. The Ashton Valve Co. had its pop safety valves, gages, gage testing outfits, and the Ashton sanitary drinking fountain well displayed while Harry Ashton and W. H. Hampson supplemented Columbus well in advocating the use of these indispensables.

The regulator shop might well have been the designation of the space of Mason Regulator Co., for regulating and reducing devices were displayed in profusion. Regulators for pumps, for dampers, for pressure, for tanks, for vacuum, for ammonia, reducing valves, relief valves, bypass valves; to meet any possible condition or requirement seems to have been the purpose in which the Company has succeeded. F. A. Morrison and F. T. Abel told all about them.

Hawk-Eye Compound. "It's a brick," was the brief but expressive description of H. E. Tibbles.

Steam was represented by A. D. Ferguson.

"There can't any clinker form on the side walls with this grate, for it rocks clear to the wall." Thus John Wood described the action of the new rocking grate made by the New England Roller Grate Co. The bar is made of small sections with flat or oval top to suit conditions and having 50 per cent of the surface air passages ⅜, ½ or ⅝ in. wide, according to the fuel to be used. "If fuel is changed, you can put in a new top to suit without changing bearers or rocking bars," was the comment of E. C. Chadwick as he demonstrated the rocking and dumping action.

Such conditions as we saw at the booth of the Travelers' Indemnity Co., heavily scaled tubes and badly corroded pipes and plates, prove that inspection and insurance are necessary and desirable; and the experiences told by F. J. Buzzell and Inspector P. F. McKay served to make this doubly sure.

Looking at the cut sections of metal hose made by the American Metal Hose Co., it was easy to see how the hook and clinch would make a pressure tight yet flexible joint, but for high pressure to make certain of durability a braided metal covering or wire winding was used. The method of attaching couplings by screw clamps was interesting, also the combination of metal hose in connection with a claflin automatic tube cleaner. Geo. K. Cowan and A. B. Friedman told us the story of the hose.

"Look who's here," and we turned to see the Perolin Dutch Kid whom the Perolin Co. of America brought to us from Germany as it did Perolin, the German boiler metal treatment. The exhibit showed just how this process separates scale from the boiler metal and fortifies the metal surface so that further scale adherence is prevented, and a little story of "How Tom Made Good" served to drive home the facts. To tell it there were: C. M. Viley, J. A. Morehouse, G. P. Bartlett, Wm. S. Pitts and W. A. Kitts, of the firm of Pitts & Kitts, and the Dutch boy was named Joe Kelley.

"Water, $29.75 a Barrel," was the startling heading on a folder handed us as we came to the booth of Geo. W. Lord Co. Then Louis Hallbauer explained that they were "throwing a little light on the boiler compound question" and told what the heading meant. It had of course to do with the action of Lord's compound and water purifying chemicals which he, with R. C. Downs and Geo. Mull were demonstrating.

They were also in charge of the exhibit of the Engineering Supply Co., showing Ohio cylinder and cup grease and the Ohio grease cylinder lubricator for feeding grease to engine cylinders.

"Peerless in name and in quality as well," stated Stephen Roberts, of the Peerless Rubber Co., in speaking of its products. It was a long list, too, and included Eclipse gaskets, Rainbow packings and belting, Peerless piston packings and belting, Rainbestos high-pressure packing, suction, steam, water, pneumatic and vacuum hose, and rubber mats and matting. With Mr. Roberts were J. E. Stevens, W. Martell and Borden Hall, representatives.

Mexican graphite for all kinds of lubrication was found in the exhibit of the U. S. Graphite Co., where A. B. Turnbull, A. W. Walker and the Mexican hat greeted us. Some of the forms they showed us were the ore as it comes from the mine, the Mexican boiler graphite for removing scale and preventing its formation, graphite cable grease for elevators, No. 205 graphite cup grease, and No. 500 for machinery lubrication. Mr. Turnbull said: "In boiler treatment the graphite may be put in periodically and will work all right, but we favor continuous feeding and have a special feeder which we sell at cost for that purpose. It is made in sizes from 1 to 4 gal. and does the work perfectly."

"We sometimes put it on independently where a plant already has heaters installed, but that flow recorder is part of the regular heater and purifier outfit where we install a complete equipment." C. E. Anderson, of the Harrison Safety Boiler Works, was speaking of the V notch flow recorder as he told of the Cochrane heaters and other specialties, the steam and oil separators, and multiport safety exhaust outlet valves.

Several engineers who had evidently had experience were mightily interested, as we came up, in listening to the explanation given by B. B. Bristol of his new pen lifting device for recording gages which leaves both hands free to remove and renew the chart without danger of a blot or smudge. It's memory proof, too, for closing the gage cover automatically replaces the pen on the chart. The device can be applied to any recording gage. Other specialties shown by the Industrial Instrument Co. were the Horn tachometers, Foxboro gages, Foxboro-Durand radial planimeter. and Foxboro indicating and record thermometers. C. E. Sullivan was at the booth with Mr. Bristol.

O-EZR-IC looks like an anagram, but it's the symbol of Albany Grease. M. D. Naughton and A. J. Olson, of the Albany Lubricating Co., helped us solve it. They showed Albany Grease in the yellow cans and Cook's Lubricant in the green. And they had 2 slogans, "Death to Friction" and "All Lubricant, No Waste."

"These 2 rain coats were won, the lady's by Mrs. M. D. Hamilton of Washington, D. C., and the man's by A. Ransom of Wheeling, W. Va.," replied W. C. Rogers, of the Mechanical Rubber Co., as we asked about them. We were at the booth where Marco lived, where the moulded diagonal wedge was found in both rubber and asbestos for expansion packings and where the braided covering was shown on steam hose which does away with wide winding and permits expansion of the inner tube. They were interesting points as told by A. C. Conway, W. E. Boylston and M. L. Higgins, but were only a few of the Marco specialties which were on display.

A real, full size grate it was that we examined in the exhibit of the Perfection Grate Co. and many interesting points were noted as we talked with C. B. Campbell, N. J. Hibbard and W. L. Cronin about it. They were summarized in A Book of Plain Facts Solving Grate Problems which was handed us as we left.

Graphite, flake graphite, Dixon flake graphite was the subject at Jos. Dixon Co.'s booth. Boiler graphite, graphite paint, graphite cup grease, graphite rope dressing, Dixon belt dressing, plain graphite; in short, graphite for any and every purpose was to be found there. L. W. Brooks and and C. A. Shaw were the Dixonian Graphitians.

Packings and pipe coverings were naturally our find where H. W. Johns-Manville Co. was on the sign. There were Kearsarge moulded gaskets, Permanite sheet packing, J. M. Sea Rings for rods, Kearsarge combination ring packings. And in coverings there was a style in air cell, asbestos or magnesia for every conceivable purpose. Besides devices to keep steam and heat in, there was the J. M. Fyro fire extinguisher to put fire out. And the representatives, B. C. McClure, E. F. Brehm, James Humphrys and D. W. Esler, Jr., said after that one it was time to put out.

In the combined exhibit of Berkshire Mill Supply Co. and W. J. Foss Co. we found circulars of lubricating oils and greases and examples of the Hyatt roller bearings of automobile and shaft hanger fame and American pressed steel split pulleys, which go on without taking down the shaft and let the belt grip tight to give great pulling power. Also Deal fire extinguishers in tube and can form.

Emerson Laboratories, analytical and industrial chemists, were represented by Mr. Emerson, and here endeth our inspection trip.

NEWS NOTES

PRELIMINARY TO A MEETING of the Uniform Electric Rate Association, to be held this month, the legal opinion of Louis D. Brandeis upon central power station rates, has been secured, and will be the principal topic for discussion. It is Mr. Brandeis' opinion that:—"Assuming that the cost of producing and delivering electric energy is the same per unit, regardless of quantity supplied, and in the absence of any statute regulating or limiting the price at which it may be sold, a Public Service Corporation cannot legally charge a lower rate for a larger than for a smaller quantity delivered at the same time and under similar conditions.

"Assuming that there is a difference between the cost of making, delivering and selling electric energy between the wholesale and the retail customer, a public service corporation can, in the absence of any statute regulating or limiting the price at which it shall be sold, make a higher price to the retail customer, but the difference in the selling price may not be substantially greater than the difference in cost."

There is some question as to what position state courts would take, in case of charges based upon the broad purpose for which the power is used—namely, a difference between light and power; but the great weight of authority seems opposed to permitting any discrimination based upon the use to which electric energy is put. It is understood that the Association intends to make a test case, and the outcome of this will be watched with interest by all connected with the power plant industry.

IT WAS ANNOUNCED RECENTLY at the Westboro, Mass., state hospital that the contract for building the central plant has been awarded to J. E. Warren & Co., Marlboro. The contract calls for a building of concrete construction one story in height and 90 by 66 ft. This will provide a power house with necessary tunnels, conduits and mains concentrating 6 plants in one. There will be erected in connection with it a concrete stack 150 ft. high. The plant will be located near the state road in the hollow between the main hospital plant and Heath hill, from which place pipes in conduits will carry the heat to the main building and other buildings grouped around it. The work of excavating will be done by patients' labor. The consulting engineers are R. D. Kimball & Co., Boston. The engineers claim the new central power plant will mean a saving of $8957. Work will begin at once.

THE BURY COMPRESSOR CO., Erie, Pa., is just starting the erection of an addition to its plant, extending the main plant 100 ft. This is necessary on account of increase in its business.

D. C. & WM. B. JACKSON, engineers, announce the removal of their Boston office from 84 State St. to 248 Boylston St. and the appointment of Edward L. Moreland as manager of their Boston office.

OTIS FUNDERBURK, formerly Michigan manager for the Rayfield Carburetor, has been appointed sales manager of the Carburetor division of the Detroit Lubricator Company, who are making and marketing the "Stewart" Carburetor.

H. W. JOHNS-MANVILLE CO. has opened a branch office and warehouse in Galveston, Tex., and now has 3 offices in the Lone Star State; viz., at Houston, Dallas and Galveston. At the last named place, in a modern brick warehouse of large proportions, will be consolidated the stock for distribution to the different offices and throughout the firm's Texas territory.

CLEVELAND, O., IS TO HAVE one of the largest electrical supply and engineering concerns in the country, as a result of the merger of the S. K. Elliott Electrical Co., 322-328 Champlain Ave.; the Ripple Engineering Co., 406-408 Schofield Building, electrical engineers; the Motor Rental and Sales Co., 1387 East 9th St. Archie Miller and W. H. Seldon of the Miller-Seldon Co., Detroit, are back of the consolidation. The new firm will be known as the Elliott Electrical Co., and will occupy the Elliott 4-story building on Champlain Ave.

WORK ON THE NEW ELECTRIC PLANT at Waterloo, Ia., has been started and the big structure, which will cost over half a million dollars, will soon be under construction. Mr. Whipple, assistant chief engineer for the American Gas Co., with headquarters in Philadelphia, is completing the plans. The plans for the plant have already been completed and are at the present time in the offices at Philadelphia, Mr. Whipple, however, is engineering the feat of draining the land and sounding the walls. A channel will be carried to the natural channel of the river.

The new plant will be one of the finest in the state and will contain all of the latest electrical appliances. From present indications it will take from 2 to 3 yr. to complete the structure, during which time the company will postpone other planned improvements.

MASSACHUSETTS BOARD of Boiler Rules is preparing regulations for the use of air tanks in that state, and among the provisions of the proposed law it is noted that the size of air tank is limited to 18 in. in diameter where it is used for the storage of compressed air at any pressure exceeding 50 lb. per square inch, for use in operating pneumatic machinery, unless the owner has a certificate of inspection issued by the Boiler Inspection Department, certifying that the tank has been inspected within the past 2 yr.

The Board of Boiler Rules reserves the right to prepare regulations for the shape, size, construction, operation, maximum pressure, gages, safety devices, etc., necessary for the safe operation of the tanks under their control. The inspection is to consist of a hammer test and also a hydrostatic test, the pressure of which shall be 1½ times the pressure allowed on the air tank.

The provisions do not apply to tanks used for the storage of compressed air when attached to locomotives, street or railway cars, vessels or motor vehicles.

Power Apparatus in Shop and Market

New Ideas In Making, Buying and Selling

NOVEL COAL AND ASH HANDLING

COMPLETENESS of the coal and ash handling apparatus in the power plant of the new print works of the Pacific Mills, South Lawrence, Mass., shows that large industrial plants are coming to appreciate that as much money can be saved by employing up-to-date apparatus in the power plant as by the use of improved machinery in the manufacturing departments.

There are 3 distinct parts to this interesting equipment. The first consists of a pivoted bucket conveyor which receives the coal from the railroad cars and distributes it into the storage pocket; and in addition a motor-driven car which distributes coal to sections of storage pocket not reached by the conveyor.

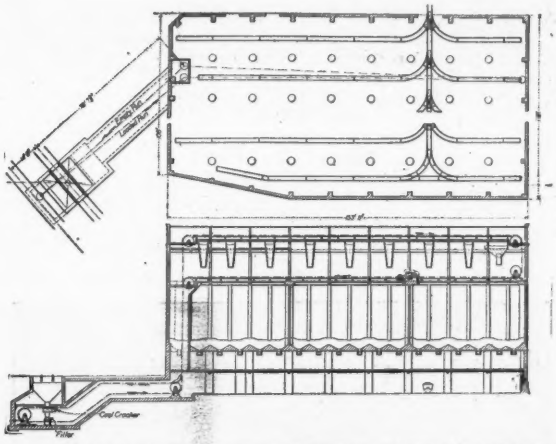


FIG. 1. PLAN AND ELEVATION SHOWING GENERAL ARRANGEMENT OF THE SYSTEM

The second part, consisting of charging cars and an industrial railway, is used to convey coal from the storage pocket to the boiler room. The third part, consisting of another industrial railway system, is for the removal of ashes.

The course of the fuel is as follows: Coal is brought to the plant in railroad cars of the bottom dumping type and is distributed directly into a pit under the track. It then passes into a Hunt electrically driven coal cracker, which breaks up the large chunks of bituminous coal into lumps of proper size for firing, thence through a revolving filler to a Hunt pivoted bucket conveyor which runs through the tunnel, shown in Fig. 2, and rises, as shown in the rear of Fig. 3, and carries coal to the distributing chutes, each of which is provided with an automatic trip so that the coal can be discharged from the conveyor buckets into any chute desired. The motor-driven conveyor driver, located on the upper level, drives by a Hunt open geared pawl driver.

Besides the coal pocket shown in Fig. 3, there is an auxiliary row of storage bins at the extreme left of the building, for filling which, the conveyor can

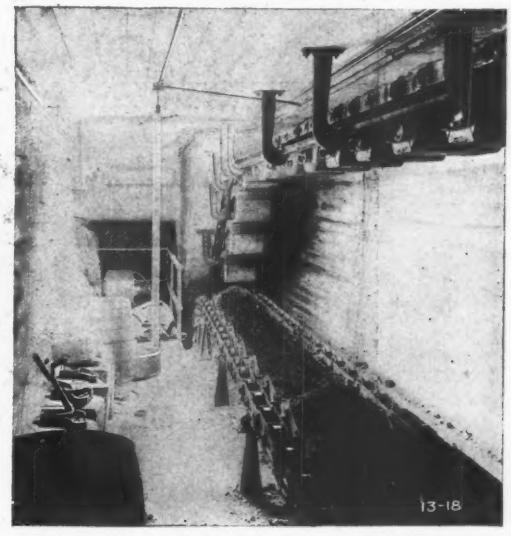


FIG. 2. PIVOTED BUCKET CONVEYOR IN TUNNEL FROM COAL CRACKER

discharge into an auxiliary hopper as shown in Fig. 4, which is used for filling an electrically operated car of 2 tons capacity, running on a track over the stor-

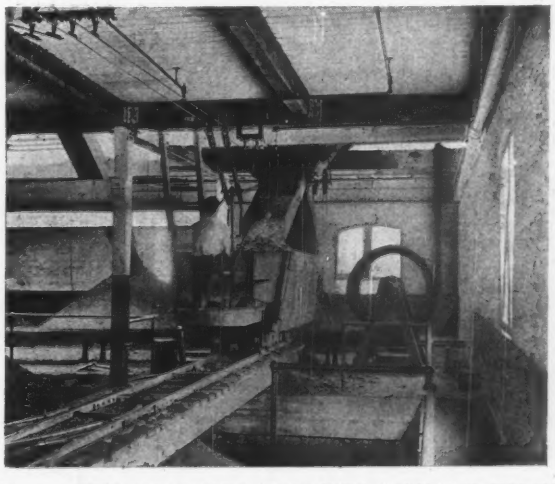


FIG. 4. DUMP CAR TAKING COAL FROM AUXILIARY HOPPER

age bins. The bins have a combined capacity of 10,000 tons of coal, but are so subdivided that the individual bins can be emptied in a few minutes in case the coal commences to heat and there is danger of spontaneous combustion.

Taking up, now, the second part of the system, from the bins shown in Fig. 3, the coal is drawn off through duplex valves into Hunt boiler room supply

The coal cars, designed especially to facilitate firing the coal into boilers, are made of sheet steel stiffened with angle iron, the corners rounded off for the

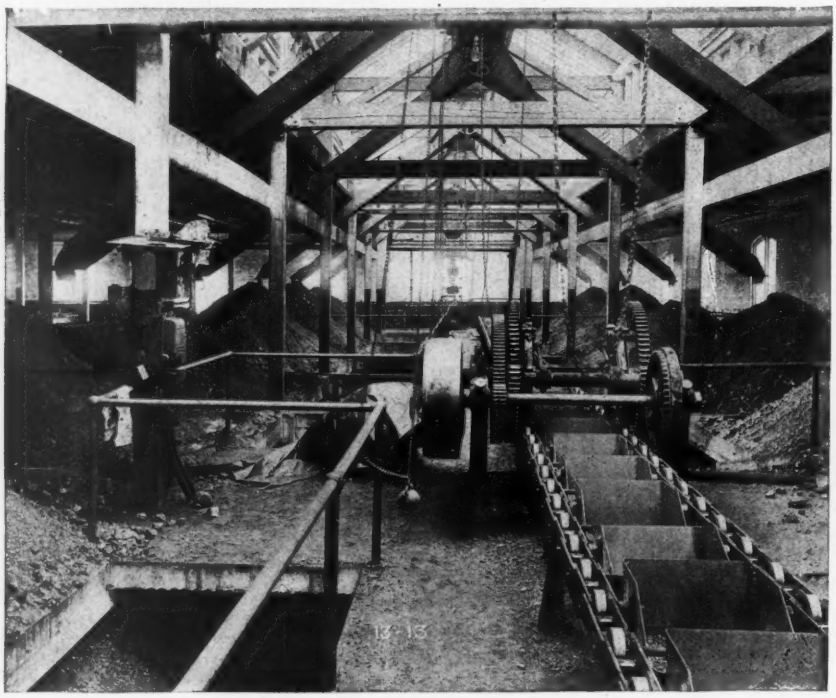


FIG. 3. TOP OF COAL BIN. VERTICAL CONVEYOR RUN IN REAR, MOTOR DRIVE AND EMPTY BUCKETS IN FRONT

cars as shown in Fig. 5, which are of one ton capacity, and can be filled in less than a minute. These cars are now pushed by hand onto scales where a complete record of all the coal burned is kept, then directly into the boiler room as shown in Fig. 6. The 2 outside tracks are so located that the fireman merely

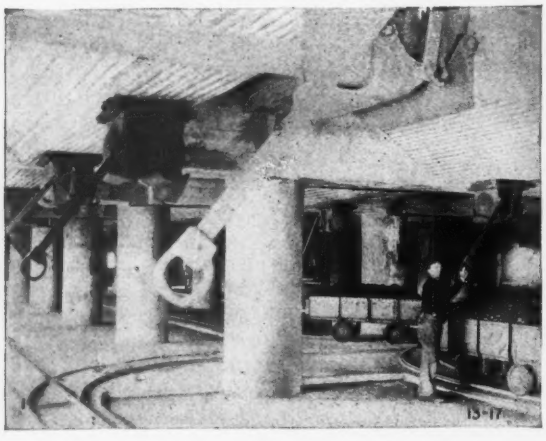


FIG. 5. LOADING BOILER ROOM SUPPLY CARS

drops the side of the car and shovels the coal directly into the furnace. The middle track provides for shunting out empties and running in full cars. As will be noted from the photograph, this system prevents coal from being spilt around the floor and permits of maintaining an extremely neat boiler room.

workmen's hands and the bottom flush riveted. When the side door is let down, its bottom is slightly higher than the floor of the car, so that the fireman will not catch his shovel when scooping up the coal. These

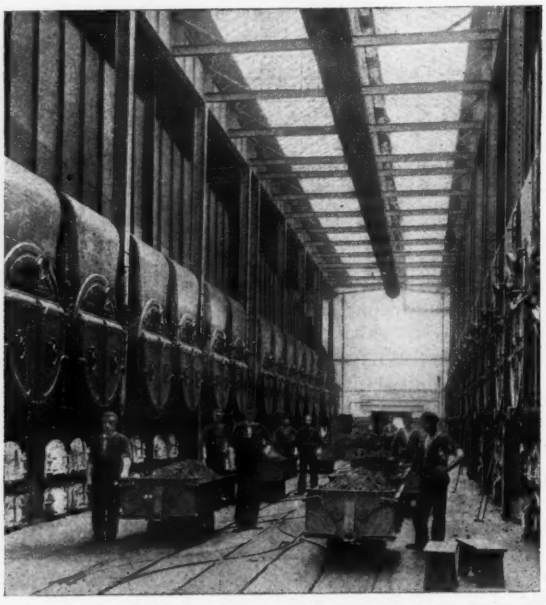


FIG. 6. BOILER ROOM, SHOWING CARS, TRACKS AND SWITCHES

cars greatly reduce the fireman's work and increase his coal handling capacity because the cars are of just the right height and distance from the fire door.

This completes the coal handling equipment, which has a capacity of 60 to 70 tons an hour, more than ample to keep the 30 boilers supplied when running at full capacity.

Figure 7 shows the room underneath the boilers, for the removal of ashes. The ash car is interesting as it has been designed so as to be practically dustproof. As soon as the car is run under the ash hopper, a lever at the top of the car is pulled down and a telescoping spout on the car is shoved up and encircles the bottom of the ash hopper, thus preventing ashes from flying around.

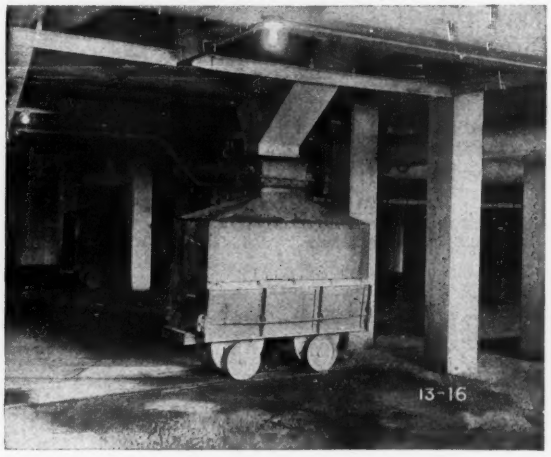


FIG. 7. ASH CHUTES AND CLOSED ASH CAR

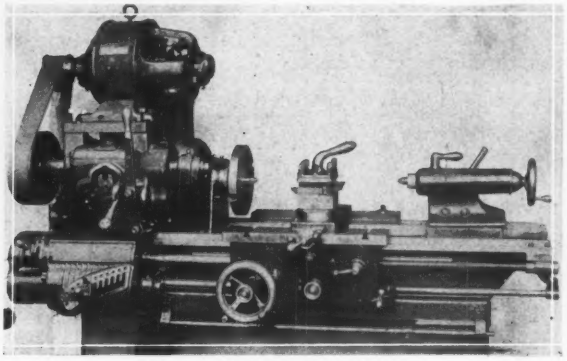
This coal and ash handling system was designed by Lockwood, Greene & Co., the apparatus, including the conveyors, charging and ash cars, motor-driven coal car, coal and ash valves, trackage, etc., used in this equipment was designed and supplied by the C. W. Hunt Co., Inc., West New Brighton, N. Y. The trackage, switches, turnouts, etc., are all of Hunt design and the cars have outside flanged wheels, permitting one man to push a one-ton load around a curve of 12 ft. radius. The coal pockets, which are of reinforced concrete faced with brick, were built by the Aberthaw Construction Company, of Boston.

FORGED STEEL FITTINGS

NUMEROUS devices have been used to form the connecting link between the boiler and high-pressure piping, and a new line of seamless forged steel fittings, forged from a single piece of open-hearth steel without a weld, has now been developed by the American Spiral Pipe Works of Chicago. The nozzle may be heated and the saddle flange bent to the required circle so that there is no separate part to become loosened when heated. This flange is of sufficient diameter to permit the use of power riveters for attaching the nozzle. The neck under the flange is heavier than the remainder of the body, providing against the working strains which are greatest at this point, and the distance between flanges is sufficient to allow the insertion of bolts from the under side, thus avoiding the use of studs. In line with this series of boiler outlet nozzles, a complete line of forged steel flanges is manufactured, which, by test, have been shown to be stronger than either malleable iron or cast steel flanges of the same size. These flanges are especially suited for high-pressure steam lines, as they are unaffected by repeated heating and cooling, and expand with the pipe, thus insuring a reliable joint.

MOTOR-DRIVEN GEARED HEAD LATHE

ILLUSTRATION herewith is a motor driven 16-in. geared head lathe manufactured by the Hendey Machine Company, Lorrington, Conn. The machine is designed to meet conditions imposed by the use of high-speed steels, and is ideal for rush jobs. The controlling levers are all within easy reach from one position in front. There are 8 mechanical changes of speed for spindle in geometric progression with power shaft running at constant speed. Four are direct



APPLICATION OF MOTOR TO GEARED HEAD LATHE

through the tumbler and gear cone, and 4 through the back gearing. There is a minimum spindle speed of 11 r.p.m. with an extreme high speed of approximately 687 r.p.m.

The carriage is stopped automatically in both directions when either feeding or screw cutting. This arrangement is invaluable for internal work to shoulders, and for duplicating pieces.

The machine is driven by a 2¾-hp. Westinghouse motor, running 900 to 1200 r.p.m.

LONGMONT AND BOULDER CAPITALISTS are behind a scheme to build in Larimer County, Colo., the largest hydro-electric power plant west of the Mississippi River. It is expected to generate 50,000 hp. and the total amount involved will be $2,000,000.

Surveys have been completed by engineers and filings made at the state capitol. The syndicate has appropriated the best portion of the Big Thompson River for power purposes. The plans involve the diversion of the water of the Big Thompson in Estes Park, and by means of tunnels and flumes, convey it to a point 8 miles this side, where a mammoth reservoir can be constructed at comparatively small cost. Another series of tunnels and flumes will carry the water to what is known as the canal on the Loveland-Estes Park highway, and in this way secure a fall of 1500 ft. The water will be carried a distance of approximately 22 miles and the route follows that of the Big Thompson where the fall is the greatest. It is expected to furnish electric current for illuminating and power purposes for all the towns of northern Colorado.

AUTOMATIC REGULATION OF SUPERHEAT

IN the temperature regulation for superheated steam 2 practical methods are available: one is to vary the amount of steam passing through the superheater at any one time; in the other, the volume of hot gases, passing over the superheating tubes, is regulated. The first has the objectionable feature that hot gases continue to flow over the superheater whether there is little or much flow of steam and overheating might result. The second method is made use of in the automatic regulator made by the Heine Safety Boiler Co.

In the Heine superheater the flow of hot gases is direct from the furnace through a flue communicating with the rear of the superheater chamber, making 2 passes over the tubes and out through the bottom at the front where a damper is located. Regulation of this damper controls the amount of gas passing through, thereby increasing or decreasing the temperature of the steam as desired.

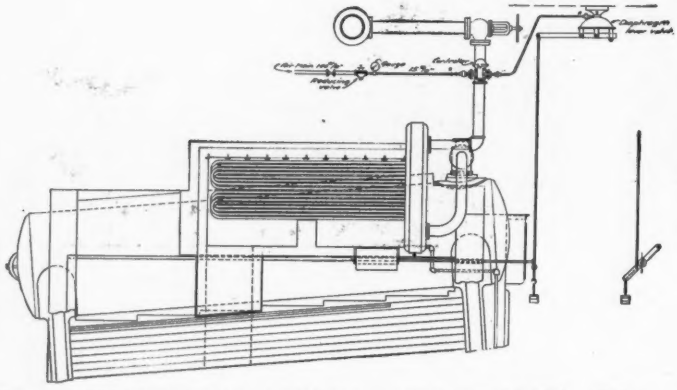


FIG. 1. ARRANGEMENT OF AUTOMATIC TEMPERATURE REGULATOR WITH HEINE SUPERHEATER

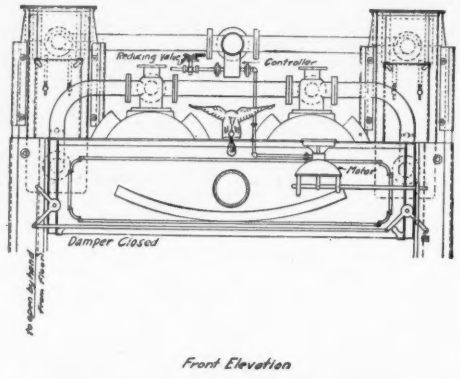


FIG. 2. AUTOMATIC TEMPERATURE REGULATOR AND SUPERHEAT DAMPER CONTROL ON LARGE HEINE BOILER WITH DOUBLE SUPERHEATER

Situated in the superheated steam outlet is a thermostat, consisting of 2 metal tubes of different coefficients of expansion. This arrangement, suitably connected to a small ball valve, controls the supply of compressed air to a diaphragm which is connected through a lever to the damper rod.

When the temperature changes, the thermostat, by the unequal expansion of tubes, causes the ball valve either to open or to close, thereby allowing air to enter or leave the diaphragm chamber where it acts on the rubber diaphragm stretched across the bottom. A "saucer" is held against the diaphragm by means of springs, which force this saucer inward when the air pressure is removed. This movement is transmitted directly to the damper through the diaphragm lever. If the temperature of the steam is below the desired amount, the damper is opened, allowing a greater quantity of heat to strike the superheater; if above, then the opposite action occurs.

A dial and an adjusting screw on the thermostat allow the mean steam temperature to be raised or lowered as desired.

The entire apparatus is easily applied in any installed plant, requiring a change only in the steam outlet and a proper connection to the damper rod.

THE UNITED STATES CIVIL SERVICE COMMISSION announces an open competitive examination for heating and ventilating engineer and draftsman, for men only, on Oct. 8 and 9, 1913, at principal cities of the country. From the register of eligibles resulting from this examination certification will be made to fill vacancies as they may occur in this position at $1200 per annum, in the Office of the Supervising Architect, Treasury Department, Washington, D. C., and vacancies in other branches of the service requiring similar qualificatons, unless it is found to be in the interest of the service to fill and vacancy by reinstatement, transfer, or promotion.

Competitors will be examined in the following subjects, which will have the relative weights indicated: 1. Practical questions in heating and ventilating (involving a competent knowledge of mathematics and plumbing, and of heating and ventilation of buildings, both theoretical and practical), 35; 2. Drawing and design (involving ability to design and draw plans, etc., for the heating and ventilating plants of modern public buildings), 35; 3. Training and experience, 30. Competitors should provide themselves with such drawing instruments and materials as may be necessary, other than paper, including a drawing board not less than 18 in. square.

Applicants must have had not less than 4 yr. of practical experience in the designing or installation of heating and ventilating systems in large buildings. A technical degree in heating and ventilating engineering will be considered equivalent to not over 2½ yr. of the 4 specified. A rating of at least 70 per cent in the subject of training and experience is a prerequisite for consideration for this position. Competitors who fail to attain an average rating of at least 70 in the first 2 subjects will not be eligible for appointment. Under an act of Congress applicants for this examination must be examined in the State or Territory in which they reside and have been actually domiciled in such State or Territory for at least 1 yr. previous to the examination. Two days of 6 and 7 hr., respectively, will be allowed for this examination. The first subject will be given on the first day and the second subject on the second day. Age, 18 yr. or over on the date of the examination.

Persons who meet the requirements and desire this examination should at once apply to the United States Civil Service Commission, Washington, D. C., or to the secretary of the board of examiners at principal cities, for application Form 1312. No application will be ac-

cepted unless properly executed and filed with the Commission at Washington in time to arrange for the examination at the place selected by the applicant. In applying for this examination the exact title "Heating and Ventilating Engineer and Draftsman" should be used.

BOOKS AND CATALOGS

ONE WHO WAS not in it and yet wishes to get a concrete idea of what happened during the 1913 flood in Ohio and Pennsylvania, should read a little book issued by the Pennsylvania Lines, general offices Pittsburgh, Pa., and written by Lewis S. Bigelow, entitled "The 1913 Flood and How it Was Met by a Railroad." While it has to do largely with the railroad affairs, the illustrations showing track, embankment and bridge destruction and the scenes during the flood in the various cities, together with the descriptive text of happenings at the time, give a vivid picture of the awfulness of the situation and the tremendous amount of labor necessary to meet the conditions at that time and to put the transportation facilities back into normal condition.

SEPARATORS FOR REMOVING OIL from exhaust steam under vacuum conditions are described in a 24-page pamphlet lately issued by the Harrison Safety Boiler Works, 3144 N. 17th St., Philadelphia, Pa. Certain interesting information on the general subject of removing oil from exhaust steam and from water condensed therefrom is also given. The publishers of this pamphlet state that some years ago they experimented with a filtering system using finely-divided powdered substances, which gave perfect results for short periods, but proved impracticable because of the rapid clogging of the filter and the excessive resistance presented to flow. Electrical treatment and coagulation have also been rejected because of expense and complication involved in their use. The mechanical method of removing the oil from the steam before it is condensed, by means of oil separators, is therefore recommended, and it is claimed to prove highly efficient, less than ¼ to ½ grain of oil appearing in a gallon of the condensate, provided oil of a suitable quality, which will not vaporize sensibly at steam temperatures, is employed.

"SELECTING MOTOR EQUIPMENT for Electrically Operated Hoists" is the title of a Bulletin (Section 3113) just issued by the Industrial and Power Department of the Westinghouse Electric & Mfg. Co. This pamphlet gives interesting data and information on the subject of hoisting equipment. A number of formulas applying to this work are given, together with examples. A diagram shows connections of different systems, and the bulletin has a question sheet for securing data on installations of this kind.

Descriptive Leaflet No. 3551 from the same company describes and illustrates alternating-current magnetic switches, designed to withstand the severest forms of industrial service.

"GUIDE TO THE INTERNATIONAL Refrigeration Exposition" is the title of a booklet received from The Vilter Manufacturing Co., which gives a description of refrigerating and ice-making machinery in the various cities which will be visited by the foreign delegation of refrigerating engineers. The book also contains maps of several of the cities, and brief descriptions of their industrial development. The book may be had from any of the Vilter offices, upon request.

A NEW CIRCULAR on Durabla sheet packing has been received from Durabla Manufacturing Co., 114-118 Liberty St., New York.

A LETTER TO USERS of 4000 Brown electric pyrometers and 100 replies are presented in a pamphlet from the Brown Instrument Company, Philadelphia, Pa.

FROM ELECTRIC MACHINERY Co., Minneapolis, Minn., we have received a new illustrated circular on induction motors.

FISHER GOVERNORS, reducing valves, etc. are described and illustrated in a new catalog, No. B-3, from the Fisher Governor Co., Marshalltown, Iowa.

BELMONT PACKING for steam, water, ammonia, hydraulic, oil, gases, acids, etc., is described and illustrated in General Catalog No. 4 from Clement Restein Company, of Philadelphia.

"FEEDING BOILERS in Power Plants," a booklet just issued by the Deming Company, Salem, O., discusses the power pump as an economic factor and illustrates some typical boiler feed pumps.

ASBESTOS PROTECTED METAL Co., Beaver Falls, Pa., has recently issued Bulletin 53, devoted to the use of asbestos protected metal in connection with concrete for the construction of roofs and curtain walls, a type of construction which the company calls Asbestosteel.

UNDERGRATE DRAFT and its relation to higher efficiencies and greater economy in the boiler room, forms the introduction to a pamphlet recently received. This bulletin, No. 14, has reference to the Canady system of automatic furnace control and is issued by Blaisdell-Canady Co., 90 West St., New York.

DESCRIPTIVE LEAFLET No. 1698 issued by the Westinghouse Electric & Mfg. Co., covers motors for driving intertype and linotype machines. The characteristics necessary for this service are explained and application views shown of motors driving these machines.

CONDENSATION is the title of a catalog from Crane Co., Chicago, describing and illustrating various types of Cranetilt traps.

Circular No. 77 A, from the same company, deals with Crane-Erwood automatic double-acting nonreturn and emergency cut-out valves.

THE TEXTILE QUARTERLY issued by the Westinghouse Electric & Manufacturing Co., is as its name indicates, a publication issued every 3 months devoted to the use of electricity in the textile industry. The cover is a unique reproduction of a piece of linen. This particular issue is devoted to motor drive in the silk industry, and a number of interesting motor applications are shown.

AMERICAN FUEL SAVING system for burning low grade fuels is described in a pamphlet recently received. This system, it is claimed, secures the most perfect combustion obtainable in boiler furnaces, producing little ash or clinkers and practically no smoke. Copies of the pamphlet may be obtained by addressing American Fuel Saving Co., 1255 Leader-News Bldg., Cleveland, O.

"MOREHEAD TILTING STEAM TRAPS" is the subject of Catalog No. 10 recently received from the Morehead Manufacturing Co., of Detroit, Mich. This book describes the Morehead "Back to Boiler" system of taking care of condensation, giving many points of interest and value in the construction, installation and operation of steam traps. The book is one which should be of interest to every man in the power plant, and may be had upon request to the manufacturers.

TRADE NOTES

THE FOLLOWING LETTER from Fred Heckler, Supt. M. P. & C., Fremont, O., which the Joseph Dixon Crucible Company of Jersey City, N. J. sends us is of much interest. It should be remembered in reading this letter that the trolley wheel probably is the hardest worked part of the electric railway equipment and receives scant attention until there is trouble.

"Referring to your communication of May 16, which was in reference to your Graphite Cup Grease No. 2 which we are using on our trolley wheels. We have been using this for the past 4 or 5 yr. for trolley lubrication.

"We manufacture our own trolley wheels and they are so constructed that we have an extra large chamber for lubricant. We use a graphite bushing for a ⅝-in. pin 2 in. long only. We take the graphite cup grease No. 2 and thin it slightly with oil, making it somewhat thinner in the winter than in the summer. This lubricant is then forced into the chambers of the wheel with a force pump in our shop and the wheel is put into the harp attached to the pole and is ready for service, and this is all the lubrication that is required for the life of the wheel. In the majority of cases we use the bushing over again on the second wheel. We have an air press for forcing these bushings in and out of wheel.

"During the past 16 yr. we have done considerable experimenting in trolley wheels and lubricants with different kinds of trolley wheels and different kinds of lubricants, and it has been our experience that the Dixon Graphite Cup Grease No. 2 is the best lubricant that can be obtained for this purpose.

"On trial equipments we have operated trolley wheels for 7000 and 8000 miles; however, in figuring up our average mileage on trolley wheels by the year, taking into consideration wheels that are lost, broken and in some cases stolen, our average mileage is approximately 4000 miles."

WESTINGHOUSE ELECTRIC & MFG. CO. reports the following, among recent orders for textile motor equipment:

Rosemary Manufacturing Co., Roanoke Rapids, N. C. Electric Drive is used throughout this plant and on the additional 300 looms individual drive will be employed, whereas on the spinning frame a total of 16 4-frame motors will be used, these motors being of 20 and 25 hp. capacity. Individual drive will also be used on the pickers, the motors being placed on the "A" frame. In addition to the above, there are to be used about 300 hp. in motors for line shaft drive.

Improvements at the plant of the W. E. Hooper & Sons Co., Baltimore, Md., are practically completed, and electric drive has been employed throughout. Power is being purchased from the Consolidated Electric Lt., Ht. & Pr. Co., and the electrical installation is said to be one of the finest in Baltimore and vicinity, 150 motors, totalling 2000 hp., being used.

Cedar Cliffs Silk Mills, Chambersburg, Pa. Individual drive is being used on all of the looms.

Postex Cotton Mills have put in operation their bleaching plant, and as in the rest of their mill electric drive has been employed.

Penn Tapestry Co., at Glen Riddle, Pa., has changed over to electric drive and installed a generator and a number of small motors.

Stroock Plush Co., of Newberg, N. Y., has added a 400-kw. engine type generator to its power equipment, as well as 350 hp. in motors, including motors for individual drive on its plush looms.

PRACTICAL ENGINEER

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POSITION WANTED—As mechanical draftsman and designer. College graduate, mechanical engineer. Completed two correspondence courses in drawing. Over year's practical drafting. A-1 references. Edward Skillman, Tribune, Kansas. 8-15-4

POSITION WANTED—Machinist, Engineer or Master Mechanic. Was erecting engines for Ingersoll-Rand Co. six years. First class man on all kinds of engines, air compressors and pumps. Can indicate and do all repairs; will go anywhere. Age 35. Address Box 317, Practical Engineer.

POSITION WANTED—Swedish, age 30, journeyman blacksmith with 6 years' experience as master mechanic in large sprinkler and steam supply house and 4 years' experience in repairing steam and gasoline engines. Wish position as master mechanic or general foreman with a sprinkler and steam supply or automobile firm. Address H. E. Wackeline, Natic Ave., Greenwood, R. I. 8-15-4

POSITION WANTED—As Chief Engineer on or about September 15, 1913. Age 40 yrs., with 25 yrs.' Practical and Theoretical training, 5 yrs. with present employer. First class New York License. Own Indicator and a good set of tools. Address Box 311, Practical Engineer. 9-15-3

POSITION WANTED—As Electrical Engineer; at present in charge of large electrical plant in New York. 12 years' technical and practical experience. Strictly sober and industrious. Address William MacInally, Pleasantville, N. Y. 8-15-4

POSITION WANTED—As Engineer in small plant, or assistant in a large plant, by man of 28 yrs. No bad habits, 3 yrs. machinist experience; understands A. & D. current; holds local engineer's license. C. H. Freeman, 57 North St., Elgin, Ill. 9-1-3

WANTED—Position as assistant engineer in large electric power plant or chief in small plant; 14 years' practical experience operating electrical and ice making machinery. Age 36, sober and steady. Correspondence invited. Address C. E. C., Box 316, Practical Engineer. 10-1-1

POSITION WANTED—By first-class Steam Engineer. A. and D. current. Can give results and best of reference. Sober and steady, 14 yrs.' experience. Address Box 309, Practical Engineer, Chicago, Ill. 10-1-1

Wanted

WANTED—Representatives to handle as a side line—a special Health and Accident policy for Engineers—paying $12.50 per week accident and $10.00 per week sick benefit, with other additional features. Premiums $3.00 quarterly. Write Agency Department, Masonic Mutual Accident Co., 121 State St., Springfield, Mass. 10-1-2

WANTED—A good man in every County to represent us Can make from $5 to $10 a day selling a line of supplies necessary in every boiler room. Write for particulars. Max Machine Company, Clinton, Mass. 10-1-1

WANTED EVERY ENGINEER to have our pamphlet for setting valves on Corliss Engines, simple and compound with one or two eccentrics. Sent free. Lindstrom's Machine Works, 200 South Third St., Allentown, Pa. tf

IF YOU ARE a night engineer, spend a few hours each day taking subscriptions for Practical Engineer. You will be paid well. Write Subscription Dept. They will start you in at once.

WANTED—Every local Engineers' Association to have an assortment of valuable power plant books—Secretary write at once, for full particulars. Address Dept. C., Practical Engineer, Chicago.

WANTED—Secretary of local Engineers' Association to write us at once in regard to a very interesting proposition. Address Practical Engineer, Circulation Department.

WANTED—ALL STEAM USERS to have clean boilers without using compounds or chemicals in any form. Write "Otis," No. 317 Norfolk Ave., Buffalo, N. Y. tf

Help Wanted

WANTED—An additional subscription solicitor wanted to cover towns in the state of Indiana. Excellent chance to earn extra money. Write to Subscription Department. tf.

WOULD LIKE TO HEAR from manufacturers' agents who are interested to take on a specialty that meets with a ready and permanent sale among mills, factories, machine shops and power plants generally. Address Sales Manager, Suite No. 2710, 165 Broadway, New York. 10-1-1

Patents and Patent Attorneys

PATENTS THAT PROTECT AND PAY. Advice and books free. Highest references. Best results. Promptness assured. Send sketch or model for free search. Watson E. Coleman, Patent Lawyer, 624 F Street, Washington, D. C. tf.

PATENTS—C. L. Parker, Attorney-at-Law and Solicitor of Patents. Patents secured promptly and with special regard to the legal protection of the invention. Handbook for inventors sent upon request. 186 McGill Building, Washington, D. C. tf.

THE PATENTOME is interesting and instructive. A liberal education in patents and how to get them. Free on request. Establish, 1865. Anderson and Son, Patent Solicitors, 710 G St., Washington, D. C. 10-1-2

PATENTS—H. W. T. Jenner, Patent Attorney and Mechanical Expert, 606 F St., Washington, D. C. Established, 1883. I make a free examination and report if a patent can be had and the exact cost. Send for full information. tf.

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PATENTABLE IDEAS WANTED—Send for 3 free books. R. B. Owens, 28 Owens Bldg., Washington, D. C. tf.

Educational and Instruction

ENGINEERS' POCKET MANUAL. 175 pages, edited by University of Tennessee, will be mailed every subscriber sending in one new subscription to Practical Engineer. Gild edges, bound in leather.

Miscellaneous

ENGINEERS AND FIREMEN—Send 10c in stamps for a 40-page pamphlet containing a list of questions asked by an examining board of engineers. Stromberg Publishing Co., 2703 Cass Ave., St. Louis, Mo. 10-1-1

IF YOU ARE an operating engineer, we know the Fetta Hot Process Water Purifier will interest you. We would be glad to have your request for further information. Address the Fetta Water Softener Co., Richmond, Ind. tf.

ENGINEERS—DO YOU WANT to utilize your exhaust steam for heating or drying purposes, without back pressure on your engine? If so, address Monash Engineering Co., 1413 W. Jackson Blvd., Chicago, Ill. tf.

MAKE MONEY on the side. Here's your chance to work out some money for yourself. Get subscriptions for Practical Engineer. It pays well. Just drop a line to the Subscription Dept. They will tell you. tf.

Sparks On The Advertising Pages

When the first John Jacob Astor tore down the five buildings on Broadway, New York City, to build the Old Astor House, there appeared in a New York paper this advertisement:

> "To Let, for one or more years, a pleasant situation and an excellent stand for a dry goods store, the corner of Vesey Street and Broadway. Inquire for particulars of John Jacob Astor, corner of Pearl and Pine Streets."

This—a "store building to let notice"—was the advertising which accompanied the erection of the biggest hotel, the United States had known, up to that time; a building which was described in a letter written by a leading New York resident:—"He is going to erect a New York 'palais royal,' which will cost him five or six hundred thousand dollars."

Soon, a new hotel is to be built in New York. It will be the largest hostelry in the world, with hundreds of rooms and a cost of over $12,000,000. Many buildings, including two of New York's leading theatres, will be torn down to make room for this Titan. Already the advance publicity notices of its erection have appeared and it is safe to predict that a very large advertising campaign will precede its opening.

Nowadays, every large hotel has its advertising department in which is prepared booklets, announcements, posters, and advertisements for United States and foreign newspapers and periodicals.

It is well known that many modern buildings are erected with the advertising feature in view. Woolworth on a European tour got the idea of erecting the mammoth Woolworth building from admiration expressed by a foreign acquaintance over the Singer building, New York. He decided that the new central home of his 5 and 10 cent stores should be gigantic enough to attract world-wide attention. And, anyone who can read, will realize that this building was 52 stories well invested in advertising.

Even in the smaller cities—the county seats—when Messrs. Jones & Smith, merchants, build a $10,000 brick store building, the county papers carry advertisements featuring this "Mammoth Mercantile Emporium"; circulars or letters are mailed to the trade; and the completion is attended by a "Grand Opening" with orchestra, flowers, and souvenirs.

In fact, as we look around us we see that every conceivable medium is turned to the uses of advertising. The reason is clear.—*Advertising is the sixth sense of the American people.* No other people have progressed so fast. No other people have contributed so much to the improvement and wealth of the world. No other people approach them in intelligence. Because; no other people have so developed the sense of advertising.

It is no exaggeration to say that the man who fails to follow and read advertisements is practically as much out of touch with our real life as a man marooned on a South Sea island.

There are men who read the advertising sections of magazines before turning to its editorial pages. You will recall, that a few weeks ago we quoted on this page an acknowledgment of this habit by William E. Gladstone, "the Grand Old Man of England."

Just now Mr. H. U. Cooper of St. Charles, Minnesota, sent us a letter well worth quoting in this connection:

> "I think your magazine is the best published. One feature that I like in particular being the one you started recently in which you describe in detail the important new plants that are going in.
>
> "I also enjoy the department devoted to the descriptions of the little kinks that brother engineers have found help them in their daily work.
>
> "AND ABOVE ALL, I LIKE THE ADVERTISING SECTIONS. I always read them first and they get as thorough a perusal as the editorial matter, for I find them to be very valuable."